126-TRC-19-006

SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems

FCA US LLC
2019 RAM 1500
NHTSA No. C20190303

TRANSPORTATION RESEARCH CENTER INC.
10820 State Route 347
East Liberty, Ohio 43319

August 16, 2019

FINAL REPORT

Prepared Under Contract No.: DTNH22-16-D-00027

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Avenue, SE
West Building, 4th Floor (NEF-210)
Washington, DC 20590

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16. Abstract A test was conducted on a 2019 RAM 1500, NHTSA No. C20190303, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-126-03 for the determination of FMVSS 126 compliance. Test failures identified were as follows: None			
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this test is to determine if the test vehicle, a MY 2019 RAM 1500, appears to meet the minimum equipment and performance requirements stated in Federal Motor Vehicle Safety Standard (FMVSS) 126, "Electronic Stability Control Systems."

This standard establishes performance and equipment requirements for Electronic Stability Control (ESC) Systems installed in passenger cars, multipurpose passenger vehicles, trucks, and buses with a gross vehicle weight rating of 4,536 kilograms or less.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS

Testing of the MY 2019 RAM 1500 was conducted at Transportation Research Center (TRC) in accordance with NHTSA TP-126-03, dated September 9, 2011.

The vehicle was inspected to ensure it was equipped with an ESC System that:

- Augments vehicle directional stability by applying and adjusting brake torques individually at each wheel to induce a correcting yaw moment to a vehicle;
- Is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- Has a means to determine the vehicle's yaw rate and to estimate its side slip or side slip derivative with respect to time;
- Has a means to monitor driver steering inputs;
- Has an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle, and
- Is operational over the full speed range of the vehicle (except at vehicle speeds less than 20km/h (12.4mph), when being driven in reverse, or during system initialization).

The vehicle was subjected to a 0.7Hz Sine with Dwell (SWD) Steering Maneuver to ensure that it would meet the stability and responsiveness requirements of the standard as follows:

- At 1.00 second after completion of steer (COS) of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 35 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
- At 1.75 seconds after completion of steer (COS) of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 20 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).

- The lateral displacement of the vehicle center of gravity with respect to its initial straight path must be at least 1.83 m (6 feet) for vehicles with a GVWR of 3,500kg (7,716 lb) or less, and 1.52 m (5 feet) for vehicles with GVWR greater than 3,500kg (7,716 lb) when computed 1.07 seconds after the Beginning of Steer (BOS) at the specified steering wheel angles.

System malfunction simulations were executed to verify vehicle could identify and indicate a malfunction.

System related malfunction and Off telltales, and related controls were inspected for required identification and labeling.

Any deviation(s) from the conditions (i.e. environmental, loading, etc.) stated in NHTSA test procedure (TP-126-03) are noted in the remarks section of the applicable data sheets. Testing with any deviation(s) from the specified conditions was performed at the request of the customer, having decided that the deviation(s) were not likely to have a significant positive or negative impact on vehicle performance.

The vehicle's ESC System appears to meet the performance and equipment requirements as required by FMVSS 126. The test results are summarized on the following summary sheet.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS …continued

DATA SUMMARY (Sheet 1 of 2)

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

VEHICLE NHTSA NO.: C20190303 VIN: 1C6SRFGT1KN552167

VEHICLE TYPE: Truck DATE OF MANUFACTURE: 05-18

LABORATORY: Transportation Research Center Inc.

REQUIREMENTS	**PASS/FAIL**
ESC Equipment and Operational Characteristics (Data Sheet 2)	
The vehicle is to be equipped with an ESC System that meets the equipment and operational characteristics requirements. (S126, S5.1, S5.6)	PASS
ESC Malfunction Telltale – Location, Labeling and Bulb Check (Data Sheet 3)	
Telltale meets the requirements for mounting, symbol or text, color and check of lamp function (S126, S5.3.1, S5.3.2, S5.3.4, S5.3.5, S5.3.6 and S5.3.8)	PASS
"ESC Off" and other System Controls and Telltale (Data Sheet 3 & 4)	
If provided, telltale meets the requirements for mounting, symbol, or text, color and check of lamp function (S126, S5.5.1, S5.5.2, S5.5.3, S5.5.6, S5.5.7, S5.5.8)	PASS
If provided, off control meets the label requirements (S126, S5.4.3)	PASS
If provided, off control and other system controls as well as the ESC off telltale meets the operational requirements (S126, S5.4, S5.4.1, S5.4.4, S5.5.4, and S5.5.9)	PASS

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS …continued

DATA SUMMARY (Sheet 2 of 2)

REQUIREMENTS	PASS/FAIL
Vehicle Lateral Stability (Data Sheet 8)	
Yaw Rate Ratio at 1.00 second after COS is less than 35% of peak value. (S126, S5.2.1)	PASS
Yaw Rate Ratio at 1.75 seconds after COS is less than 20% of peak value. (S126, S5.2.2)	PASS
Vehicle Responsiveness (Data Sheet 8)	
Lateral displacement at 1.07 seconds after BOS is at least 1.83 m (6 feet) for vehicles with a GVWR of 3,500 kg (7,716 lbs.) or less, and 1.52 m (5 feet) for vehicles with a GVWR greater than 3,500 kg (7,716 lbs.). (S126 S5.2.3)	PASS
ESC Malfunction Warning (Data Sheet 9)	
Warning is provided to driver after malfunction occurrence. (S126. S5.3)	PASS
Malfunction telltale stayed illuminated as long as malfunction existed and must extinguish after malfunction was corrected. (S126, S5.3.3 and S5.3.7)	PASS

REMARKS:

3.0 TEST DATA

DATA SHEET 1 (Sheet 1 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

NHTSA No.: C20190303 TEST DATE: 7-24-19

VIN: 1C6SRFGT1KN552167 MANUFACTURE DATE: 05-18

GVWR: 3,221 KG FRONT GAWR: 1,770 KG REAR GAWR 1,860 KG

SEATING POSITIONS: FRONT 3 MID _____ REAR 3

ODOMETER READING AT START OF TEST: 35 (56) Miles (Kilometers)

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:

Front Axle 275/65R18 Rear Axle 275/65R18

INSTALLED TIRE SIZE(S) ON VEHICLE:

From Tire Sidewall	Front Axle	Rear Axle
Manufacturer and Model	Bridgestone Dueler H/T	Bridgestone Dueler H/T
Tire Size Designation	275/65R18	275/65R18

TIN Left Front DOT 9BYJ DHT 1518 Right Front DOT 9BYJ DHT 1518

Left Rear DOT 9BYJ DHT 1518 Right Rear DOT 9BYJ DHT 1518

Are installed tire sizes same as labeled tire sizes? X Yes _____ No
If no, contact COTR for further guidance.

DRIVE CONFIGURATIONS (MARK ALL THAT APPLY):

X Two Wheel Drive (2WD): ( ) Front Wheel Drive (X) Rear Wheel Drive
_____ All Wheel Drive (AWD)
_____ Four Wheel Drive Automatic – differential not locked full time (4WD Automatic)
X Four Wheel Drive High Gear Locked Center Differential (4WD HGLD)
X Four Wheel Drive Low Gear (4WD Low)
_____ Other (define _____)

3.0 TEST DATA….continued

DATA SHEET 1 (Sheet 2 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION

DRIVE CONFIGURATIONS AND MODES: (ex. default, performance, off-road)
(For each of the vehicle's drive configurations identify available operating modes)

Drive Configuration 2WD - RWD
Mode(s) default

Drive Configuration 4WD High
Mode(s) off-road

Drive Configuration 4WD Low
Mode(s) off-road

VEHICLE STABILITY SYSTEMS (Check applicable technologies):

X ESC X Traction Control X Roll Stability Control

Active Suspension X Electronic Throttle Control X Active Steering

X ABS

List other systems; _____

_____

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 2 (Sheet 1 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

NHTSA No.: C20190303 TEST DATE: 7-24-19

ESC SYSTEM IDENTIFICATION:

Manufacturer / Model Continental Teves MK100XT

ESC SYSTEM HARDWARE (Check applicable hardware):

X Electronic Control Unit	X Hydraulic Control Unit
X Wheel Speed Sensors	X Steering Angle Sensor
X Yaw Rate Sensor	X Lateral Acceleration Sensor

List other components; _____

ESC SYSTEM OPERATIONAL CHARACTERISTICS:

System is capable of generating brake torques at each wheel X Yes (PASS)
_____ No (FAIL)

Brief explanation with reference to components used:
The hydraulic control unit with an integrated electronic control unit including a primary pressure sensor is able to adjust brake pressure at each wheel individually by switching valves and activation of the pump, independent from the driver's brake actuation.

System is capable of determining yaw rate X Yes (PASS)
_____ No (FAIL)

Brief explanation with reference to components used:
The ESC system uses a yaw rate sensor for the determination of the yaw rate of the vehicle.

System is capable of monitoring driver steering input X Yes (PASS)
_____ No (FAIL)

Brief explanation with reference to components used:
The actual value of driver steering input is supplied by a steering angle sensor.

3.0 TEST DATA….continued

DATA SHEET 2 (Sheet 2 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC SYSTEM OPERATIONAL CHARACTERISTICS (continued):

System is capable of estimating side slip or side slip derivative ___X___ Yes (PASS)
_____ No (FAIL)

Brief explanation with reference to data collected and method used:
The ESC uses the yaw rate sensor and lateral acceleration sensor for the determination of the vehicle yaw behavior and the estimation of the side slip derivative.

System is capable of modifying engine torque during ESC activation.
___X___ Yes (PASS)
_____ No (FAIL)

Brief explanation of method used to modify engine torque:
The ESC system can perform a reduction of engine torque by sending an engine torque request via the engine management interface. For most if not all applications, torque cuts will use throttle, spark timing and fuel shut off.

System is capable of activation at speeds of 20 km/h (12.4 mph) and higher. ___X___ Yes (PASS)
_____ No (FAIL)

Speed system becomes active. ESC system becomes fully active at 13.8 km/h.

System is capable of activation during the following driving phases (acceleration, deceleration, coasting, and during activation of ABS or traction control). ___X___ Yes (PASS)
_____ No (FAIL)

Vehicle manufacturer submitted documentation explaining how the ESC system mitigates understeer? ___X___ Yes (PASS)
_____ No (FAIL)

DATA INDICATES COMPLIANCE PASS/FAIL _____PASS_____

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 3 (Sheet 1 of 4)
ESC MALFUNCTION AND OFF TELLTALES
Location, Labeling and Bulb Check

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

VEHICLE NHTSA NO. C20190303 TEST DATE: 7-24-19

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? X Yes (Pass) ____ No (Fail)

Telltale Location Inside the tachometer

Telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

X Yes (Pass) ____ No (Fail) If no, explain ____

Malfunction Telltale symbol or abbreviation required by FMVSS No. 101.

Or **ESC**

X Vehicle uses this symbol
____ Vehicle uses this abbreviation
____ Other (Fail)

Note any words or additional symbols used.

Is ESC malfunction telltale part of a common space? ____ Yes X No

Is ESC malfunction telltale also used to indicate activation of the ESC system?

X Yes ____ No

If yes, explain telltale operation during ESC activation:

During ESC activation, the ESC telltale flashes.

DATA SHEET 3 (Sheet 2 of 4)
ESC MALFUNCTION AND OFF TELLTALES
Location, Labeling and Bulb Check

"ESC OFF" Telltale (if provided)

Vehicle is equipped with "ESC Off" telltale? __X__ Yes _____ No

Is "ESC OFF" telltale combined with "ESC Malfunction" telltale utilizing a two part telltale?

_____ Yes __X__ No

Telltale Location Inside the tachometer

Telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

__X__ Yes (Pass) _____ No (Fail) If no, explain _____

"ESC OFF" Telltale symbol or abbreviation required by FMVSS No. 101.

Or **ESC OFF**

__X__ Vehicle uses this symbol
_____ Vehicle uses this abbreviation
_____ Other (Fail)

Note any words or additional symbols used.

_____

_____

_____

Is ESC Off telltale part of a common space? _____ Yes __X__ No

DATA SHEET 3 (Sheet 3 of 4)
ESC MALFUNCTION AND OFF TELLTALES
Location, Labeling and Bulb Check

Malfunction Telltale Lamp Function, OR Two-Part Malfunction/Off Telltale Lamp Function:
Identify position of starting system when telltale illuminates.

☐ OFF/LOCK ☐ Between OFF/LOCK and ON/RUN
☒ ON/RUN ☐ Between ON/RUN and Start

Is telltale yellow in color? __X__ Yes _____ No (fail)

Time telltale remains illuminated __3__ seconds

Note: If telltale is part of common space, it is not required to illuminate during this check of lamp function.

Starter Interlock:
Does vehicle have any starter, transmission or other interlocks that affect operation of the telltale lamp check functions? _____ Yes __X__ No

If yes, describe the interlock feature:

_____

_____

"ESC OFF" Telltale Lamp Function (If separate from Malfunction Telltale):
Identify position of starting system when "ESC OFF" telltale illuminates.

☐ OFF/LOCK ☐ Between OFF/LOCK and ON/RUN
☒ ON/RUN ☐ Between ON/RUN and Start

Is telltale yellow in color? __X__ Yes _____ No (fail)

Time telltale remains illuminated __3__ seconds

Note: If telltale is part of common space, it is not required to illuminate during the check of lamp function.

DATA SHEET 3 (Sheet 4 of 4)
ESC MALFUNCTION AND OFF TELLTALES
Location, Labeling and Bulb Check

Starter Interlock:
Does vehicle have any starter, transmission or other interlocks that affect operation of the "ESC OFF" telltale lamp check functions? _____ Yes __X__ No

If yes, describe the interlock feature:

_____

_____

DATA INDICATES COMPLIANCE PASS/FAIL ____PASS___

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

DATA SHEET 4 (Sheet 1 of 4)
ESC AND ANCILLARY SYSTEM CONTROLS

"ESC OFF" Controls Identification and Operational Check:

Is the vehicle equipped with a control or controls whose purpose is to deactivate the ESC system or place the ESC system in a mode or modes that may no longer satisfy the performance requirements of the standard?

__X__ Yes _____ No

Type of control or controls provided? (mark all that apply)

_____ Dedicated "ESC Off" control
__X__ Multi-functional control with an "ESC Off" mode
_____ Other (describe)

REMARKS:

*Electronic Stability Control cannot be turned off by the driver in 2WD mode, only 4WD High.

Identify each control location, labeling and selectable modes.

First Control: (If applicable)

Location Center console, under HVAC controls
Labeling Skidding car symbol, with "Off" underneath
Modes Traction Control off – momentary press
ESC off – press and hold for 5 seconds (4WD High only)

"ESC OFF" Control identification symbol or abbreviation required by FMVSS No. 101.

Or **ESC OFF**

__X__ Vehicle uses this symbol
_____ Vehicle uses this abbreviation

Note any words or additional symbols used.

3.0 TEST DATA….continued

DATA SHEET 4 (Sheet 2 of 4)
ESC AND ANCILLARY SYSTEM CONTROLS

Second Control: (If applicable)
Location N/A
Labeling _____
Modes _____

"ESC OFF" Control identification symbol or abbreviation required by FMVSS No. 101.

Or **ESC OFF**

_____ Vehicle uses this symbol
_____ Vehicle uses this abbreviation

Note any words or additional symbols used.

_____

_____

Identify standard or default drive configuration Default - 2WD

Verify standard or default drive configuration selected. X Yes _____ No

Does the "ESC Off" telltale illuminate upon activation of the ESC off control or selection of the "ESC Off" mode on the multi-function control?

_____ NA X Yes _____ No (fail)

Does the "ESC Off" telltale extinguish when the starting system is cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position?

_____ NA X Yes _____ No (fail)

If no, describe how the off control functions:

_____

_____

3.0 TEST DATA….continued

DATA SHEET 4 (Sheet 3 of 4)
ESC AND ANCILLARY SYSTEM CONTROLS

If a multi-function control is provided, cycle through each mode setting on the control and record which modes illuminate the "ESC Off" telltale. Also, for those modes that illuminate the "ESC Off" telltale, identify if the telltale extinguishes upon cycling the ignition system.

Control Modes	"ESC Off" telltale illuminates upon activation of control? (Yes/No)	"ESC Off" telltale extinguishes upon cycling ignition? (Yes/No)
Traction Control off	Yes	Yes
ESC off (4WD High only)	Yes	Yes

For each mode that illuminates the "ESC Off" telltale, did the telltale extinguish when the ignition was cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position?

_____ NA ___X__ Yes _____ No (fail)

Other System Controls that have an ancillary effect on ESC Operation:

Is the vehicle equipped with any ancillary controls that upon activation may deactivate the ESC System or place the ESC System in a mode or modes that may no longer satisfy the performance requirements of the standard?

___X__ Yes _____ No

List and describe each control (i.e. alternate drive configuration selection controls):

Ancillary Control: System 4WD Low
Control Description Shift to N, hold button for 3 seconds
Labeling "4WD Low"

Ancillary Control: System N/A
Control Description
Labeling

3.0 TEST DATA….continued

DATA SHEET 4 (Sheet 4 of 4)
ESC AND ANCILLARY SYSTEM CONTROLS

Activate each control listed above and record whether the control illuminates the "ESC Off" telltale. Also, record warnings or messages provided regarding the ESC System.

Ancillary Control	Control Activates "ESC Off" Telltale? (Yes/No)	Warnings or Messages Provided
4WD Low	Yes	

For those controls that illuminate the "ESC Off" telltale above identify if the "ESC Off" telltale extinguishes upon cycling the ignition system.

Ancillary Control	"ESC Off" telltale extinguishes upon cycling ignition? (Yes/No)
4WD Low	No

For each control that illuminates the "ESC Off" telltale, did the telltale extinguish when the ignition is cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position? If the control activated places the vehicle into a low-range four-wheel drive configuration designed for low-speed, off–road driving, the ESC System may remain turned off after the ignition has been cycled off and then back on and therefore the "ESC Off" telltale may not extinguish.

_____ NA __X__ Yes _____ No (fail)

DATA INDICATES COMPLIANCE: PASS/FAIL PASS

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 5 (Sheet 1 of 3)
VEHICLE AND TEST TRACK DATA

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

NHTSA No.: C20190303 TEST DATE: 7-24-19

Test Track Requirements: Test Surface Slope (0-1 %) 1 %

Peak Friction Coefficient (at least 0.9) 0.93

Test Track Data Meets Requirements: Yes/No Yes
If no, explain: _____

Full Fluid Levels: Fuel N/A Coolant X Other Fluids Washer (specify)

Tire Pressures: Required: Front Axle 250 kPa Rear Axle 250 kPa

Actual: LF 250 kPa RF 250 kPa
LR 250 kPa RR 250 kPa

Vehicle Dimensions: Track Width 173.5 cm Wheelbase 367.4 cm

Vehicle weight ratings: GAWR Front 1,770 KG GAWR Rear 1,860 KG

Unloaded Vehicle Weight (UVW)

Front Axle 1410.4 KG Left Front 717.8 KG Right Front 692.6 KG

Rear Axle 974.4 KG Left Rear 499.0 KG Right Rear 475.4 KG

Total UVW 2384.8 KG

Baseline Weight and Outrigger Selection (only for MPVs, Trucks, Buses)

Calculated Baseline Weight (UVW+ 73 kg) 2457.8 KG

Outrigger size required ("Light," "Standard" or "Heavy") Standard
Light – Baseline weight under 1,588 kg (3,500 lbs.)
Standard - Baseline weight equal to or greater than 1,588 kg (3,500 lbs.) and under 2,722 kg (6,000 lbs.)
Heavy - Baseline weight equal to or greater than 2,722 kg (6,000 lbs.)

DATA SHEET 5 (Sheet 2 of 3)
VEHICLE AND TEST TRACK DATA

UVW with Outriggers (only for MPVs, Trucks, Buses)

Front Axle 1438.8 KG Left Front 730.0 KG Right Front 708.8 KG

Rear Axle 1006.2 KG Left Rear 517.2 KG Right Rear 489.0 KG

Total UVW w/ Outriggers 2445.0 KG

Loaded Vehicle Weight w/ Driver and Instrumentation (No Ballast)

Front Axle 1528.2 KG Left Front 782.2 KG Right Front 746.0 KG

Rear Axle 1052.2 KG Left Rear 540.4 KG Right Rear 511.8 KG

Vehicle Weight 2580.4 KG

Ballast Required = [**Total UVW** + 168 KG] - **Loaded Weight w/ Driver and Instrumentation**

= [2445.0 KG + 168 KG] - 2580.4 KG

= 32.6 KG

Total Loaded Vehicle Weight w/Driver, Instrumentation and Ballast

Front Axle 1546.2 KG Left Front 791.8 KG Right Front 754.4 KG

Rear Axle 1066.6 KG Left Rear 547.4 KG Right Rear 519.2 KG

Total Loaded Vehicle Weight 2612.8 KG

3.0 TEST DATA….continued

DATA SHEET 5 (Sheet 3 of 3)
VEHICLE AND TEST TRACK DATA

Center of Gravity and Inertial Sensing System Location at Loaded Vehicle Condition

x-distance (longitudinal) Point of reference is the front axle centerline. (Positive from front axle toward rear of vehicle.)

y-distance (lateral) Point of reference is the vehicle centerline. (Positive from the center toward the right.)

z-distance (vertical) Point of reference is the ground plane. (Positive from the ground up.)

Locations:

	Center of Gravity	Inertial Sensing System
x-distance	150.0 cm	190.6 cm
y-distance	-2.2 cm	-2.8 cm
z-distance	72.4 cm	107.9 cm

Roof Height: 190.6 cm

Distance Between Body Roll Sensors: 213.2 cm

The NHTSA test procedure (TP-126-03) states that the vehicle's vertical CG coordinate is estimated to be 38% of the vehicle's roof height. The lateral and longitudinal CG coordinates are determined using the individual corner weights of the vehicle in its test condition.

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 6 (Sheet 1 of 3)
BRAKE AND TIRE CONDITIONING

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

VEHICLE NHTSA No.: C20190303

Measured Cold Tire Pressures: LF 250 kPa RF 250 kPa

LR 250 kPa RR 250 kPa

Wind Speed 4.0 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 21.7 °C

Brake Conditioning Time; 12:00 PM Date; 7-24-19

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required) 10 stops

Observed deceleration rate range (.5g target) 0.47 – 0.51 g

72 km/h (45 mph) Brake Stops

Number of stops executed (3 required) 3 stops

Number of stops ABS activated (3 required) 3 stops

Observed deceleration rate range 0.95 - 1.0 g

72 km/h (45 mph) Brake Cool Down Period

Duration of cool down period (5 minutes min.) 5.5 minutes

DATA SHEET 6 (Sheet 2 of 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning Series No. 1 Time: 12:20 PM Date: 7-24-19

Measured Tire Pressures: LF 260 kPa RF 260 kPa

LR 256 kPa RR 256 kPa

Wind Speed 3.1 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 21.8 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	Clockwise	0.5-0.6	0.54	45.9
4-6	Counterclockwise	0.5-0.6	0.54	45.9

1 Hz 5 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h(mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	30	0.5-0.6	0.27
2	56±2 (35±1)	60	0.5-0.6	0.49
3	56±2 (35±1)	70	0.5-0.6	0.57
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 70 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	70 (cycles 1-10)	0.5-0.6	0.57
4	56±2 (35±1)	70 (cycles 1-9)	0.5-0.6	0.57
		140 (cycle 10)*	N/A	0.78

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

DATA SHEET 6 (Sheet 3 of 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning Series No. 2 Time: 1:10 PM Date: 7-24-19

Measured Tire Pressures: LF 270 kPa RF 270 kPa

LR 265 kPa RR 265 kPa

Wind Speed 4.5 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 22.9 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	clockwise	0.5-0.6	0.54	45.9
4-6	counterclockwise	0.5-0.6	0.54	45.9

1 Hz 5 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	N/A	0.5-0.6	N/A
2	56±2 (35±1)		0.5-0.6	
3	56±2 (35±1)		0.5-0.6	
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 70 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	70 (cycles 1-10)	0.5-0.6	0.57
4	56±2 (35±1)	70 (cycles 1-9)	0.5-0.6	0.57
		140 (cycle 10)*	N/A	0.78

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 7 (1 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

VEHICLE NHTSA No.: C20190303 TEST DATE: 7-24-19

Measured Tire Pressures: LF 270 kPa RF 270 kPa
LR 265 kPa RR 265 kPa

Wind Speed 3.1 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 21.8 °C

Selected Drive Configuration: RWD (default)

Selected Mode: ESC On (default)

Preliminary Left Steer Maneuver:
Lateral Acceleration measured at 30 degrees steering wheel angle ($a_{y,30\ degrees}$)

$a_{y,30\ degrees}$ = 0.32 g

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at .55g.

$$\frac{30\ \text{degrees}}{a_{\text{y,30degrees}}} = \frac{\delta_{SIS}}{0.55\ \text{g}}$$

δ_{SIS} = 51.6 degrees @ 0.55g

δ_{SIS} = 60 degrees (rounded)

Steering Wheel Angle at Corrected 0.3 g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1 degree (degrees)	All Conditions Met?
0006	Left	12:37 pm	-35.2	Yes
0008	Left	12:42 pm	-35.4	Yes
0009	Left	12:43 pm	-35.6	Yes
0010	Right	12:45 pm	34.1	Yes
0011	Right	12:46 pm	35.2	Yes
0012	Right	12:48 pm	35.0	Yes

3.0 TEST DATA….continued

DATA SHEET 7 (2 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

Average Overall Steering Wheel Angle:

$$\delta_{0.3\ g,\ overall} = (|\delta_{0.3\ g,\ left\ (1)}| + |\delta_{0.3\ g,\ left\ (2)}| + |\delta_{0.3\ g,\ left\ (3)}| + \delta_{0.3\ g,\ right\ (1)} + \delta_{0.3\ g,\ right\ (2)} + \delta_{0.3\ g,\ right\ (3)}) / 6$$

$\delta_{0.3\ g,\ overall}$ = 35.1 degrees
[to nearest 0.1 degree]

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 8 (1 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

VEHICLE NHTSA No.: C20190303 TEST DATE: 7-24-19

Tire conditioning completed	X Yes	____ No
ESC system is enabled	X Yes	____ No
On track calibration checks have been completed	X Yes	____ No
On track static data file for each sensor obtained	X Yes	____ No

Selected Drive Configuration: RWD
Selected Mode: ESC On (default)

Overall steering wheel angle ($\delta_{0.3\ g,\ overall}$) 35.1 degrees

Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle[1] (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar	Angle	Ψ_{Peak}	$\Psi_{1.0sec}$	$\Psi_{1.75sec}$	%	Pass/ Fail	%	Pass/ Fail
0014	1:13 pm	1.5* δ0.3 g	53	12.542	0.089	0.532	0.710	Pass	4.244	Pass
0015	1:15 pm	2.0* δ0.3 g	70	14.525	-0.096	0.183	-0.661	Pass	1.262	Pass
0016	1:17 pm	2.5* δ0.3 g	88	17.802	-0.140	0.477	-0.788	Pass	2.678	Pass
0017	1:19 pm	3.0* δ0.3 g	105	21.411	-0.162	0.499	-0.757	Pass	2.329	Pass
0018	1:22 pm	3.5* δ0.3 g	123	24.459	-0.206	0.417	-0.842	Pass	1.704	Pass
0019	1:24 pm	4.0* δ0.3 g	140	24.983	-0.013	0.188	-0.052	Pass	0.752	Pass
0020	1:26 pm	4.5* δ0.3 g	158	27.151	-0.176	0.310	-0.648	Pass	1.143	Pass
0021	1:29 pm	5.0* δ0.3 g	176	28.190	-0.140	0.213	-0.495	Pass	0.757	Pass
0022	1:31 pm	5.5* δ0.3 g	193	27.402	-0.142	0.116	-0.519	Pass	0.425	Pass
0023	1:34 pm	6.0* δ0.3 g	211	27.770	0.025	0.082	0.091	Pass	0.296	Pass
0024	1:37 pm	6.5* δ0.3 g	228	29.104	0.026	0.260	0.091	Pass	0.892	Pass
0025	1:40 pm	7.0* δ0.3 g	246	29.010	-0.149	0.094	-0.512	Pass	0.325	Pass
0026	1:43 pm	7.5* δ0.3 g	263	30.898	0.100	0.286	0.325	Pass	0.925	Pass
0027	1:47 pm	7.7* δ0.3 g	270	31.272	-0.069	-0.078	-0.222	Pass	-0.249	Pass

1. Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5*\delta_{0.3\ g,\ overall}$ or 270 degrees is utilized, whichever is greater provided the calculated magnitude of $6.5*\delta_{0.3\ g,\ overall}$ is less than or equal to 300 degrees. If $6.5*\delta_{0.3\ g,\ overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5*\delta_{0.3\ g,\ overall}$ without exceeding the 270 degree steering wheel angle.

3.0 TEST DATA….continued

DATA SHEET 8 (2 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle[1] (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar	Angle	Ψ_{Peak}	$\Psi_{1.0sec}$	$\Psi_{1.75sec}$	%	Pass/ Fail	%	Pass/ Fail
0028	1:49 pm	1.5* δ0.3 g	53	-12.199	-0.126	0.012	1.030	Pass	-0.095	Pass
0029	1:52 pm	2.0* δ0.3 g	70	-15.768	0.084	0.401	-0.531	Pass	-2.543	Pass
0030	1:54 pm	2.5* δ0.3 g	88	-18.589	-0.118	0.778	0.634	Pass	-4.184	Pass
0031	1:57 pm	3.0* δ0.3 g	105	-21.449	0.209	0.467	-0.976	Pass	-2.176	Pass
0032	1:59 pm	3.5* δ0.3 g	123	-24.848	0.292	0.659	-1.175	Pass	-2.652	Pass
0033	2:01 pm	4.0* δ0.3 g	140	-25.354	0.374	0.109	-1.476	Pass	-0.431	Pass
0034	2:04 pm	4.5* δ0.3 g	158	-27.083	0.317	0.479	-1.171	Pass	-1.770	Pass
0035	2:07 pm	5.0* δ0.3 g	176	-28.969	0.343	-0.072	-1.184	Pass	0.248	Pass
0036	2:09 pm	5.5* δ0.3 g	193	-28.533	0.252	0.142	-0.882	Pass	-0.498	Pass
0037	2:11 pm	6.0* δ0.3 g	211	-29.763	0.251	-0.119	-0.844	Pass	0.400	Pass
0038	2:13 pm	6.5* δ0.3 g	228	-29.448	0.078	-0.064	-0.264	Pass	0.218	Pass
0039	2:16 pm	7.0* δ0.3 g	246	-30.278	0.407	0.224	-1.343	Pass	-0.739	Pass
0040	2:18 pm	7.5* δ0.3 g	263	-30.413	0.000	0.155	-0.001	Pass	-0.511	Pass
0041	2:21 pm	7.7* δ0.3 g	270	-30.335	0.066	-0.019	-0.218	Pass	0.061	Pass

1. Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5*\delta_{0.3\ g,\ overall}$ or 270 degrees is utilized, whichever is greater provided the calculated $6.5*\delta_{0.3\ g,\ overall}$ is less than or equal to 300 degrees. If $6.5*\delta_{0.3\ g,\ overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5*\delta_{0.3\ g,\ overall}$ without exceeding the 270 degree steering wheel angle.

During execution of the sine with dwell maneuvers were any of the following events observed?

Rim-to-pavement contact	_____ Yes	__X__ No
Tire debeading	_____ Yes	__X__ No
Loss of pavement contact of vehicle tires	_____ Yes	__X__ No
Did the test driver experience any vehicle loss of control or spinout?	_____ Yes	__X__ No

If "Yes" explain the event and consult with the COTR. _____

_____

3.0 TEST DATA….continued

DATA SHEET 8 (3 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Responsiveness – Lateral Displacement

Maneuver #	Initial Steer Direction	Commanded Steering Wheel Angle ($5.0*\delta_{0.3\ g,\ overall}$ or greater)		Calculated Lateral Displacement[1]	
		Scalar	Angle (degrees)	Distance (m)	Pass/Fail
0021	Counter Clockwise	5.0* δ0.3 g	176	-2.70	Pass
0022	Counter Clockwise	5.5* δ0.3 g	193	-2.72	Pass
0023	Counter Clockwise	6.0* δ0.3 g	211	-2.70	Pass
0024	Counter Clockwise	6.5* δ0.3 g	228	-2.69	Pass
0025	Counter Clockwise	7.0* δ0.3 g	246	-2.74	Pass
0026	Counter Clockwise	7.5* δ0.3 g	263	-2.70	Pass
0027	Counter Clockwise	7.7* δ0.3 g	270	-2.75	Pass
0035	Clockwise	5.0* δ0.3 g	176	2.53	Pass
0036	Clockwise	5.5* δ0.3 g	193	2.62	Pass
0037	Clockwise	6.0* δ0.3 g	211	2.57	Pass
0038	Clockwise	6.5* δ0.3 g	228	2.55	Pass
0039	Clockwise	7.0* δ0.3 g	246	2.53	Pass
0040	Clockwise	7.5* δ0.3 g	263	2.59	Pass
0041	Clockwise	7.7* δ0.3 g	270	2.58	Pass

1. Lateral displacement should be ≥ 1.83 m (6 ft) for vehicles with a GVWR of 3,500 kg (7,716 lb) or less; and ≥ 1.52 m (5ft) for vehicles with a GVWR greater than 3,500 kg (7,716 lb).

DATA INDICATES COMPLIANCE: PASS/FAIL PASS

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 9 (Sheet 1 of 6)
MALFUNCTION WARNING TEST
(Test Number __1__)

VEHICLE MAKE/MODEL/BODY STYLE: RAM / 1500 / Truck

VEHICLE NHTSA No.: C20190303 TEST DATE: 7-24-19

METHOD OF MALFUNCTION SIMULATION:
Describe method of malfunction simulation:

Remove the 50A fuse (F26) for the ESC Module.

MALFUNCTION TELLTALE ILLUMINATION:
Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12. B.

__X__ Yes _____No (Fail)

Telltale illuminated when engine was started, no driving required.

__X__ Yes (Pass) _____No

Driving was required to illuminate telltale. _____ Yes __X__No

When driving was required, telltale illuminated before vehicle speed of 48± 8 km/h (30± 5mph) was reached.

__X__NA _____ Yes (Pass) _____No

If driving required, approximate driving time below vehicle speed of 48± 8 km/h (30± 5mph) to activate telltale.

_____ Seconds

When driving was required, telltale illuminated after a vehicle speed above 48± 8 km/h (30± 5mph) was reached.

__X__NA _____ Yes _____No

If driving required, time for telltale to illuminate after starting system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.

_____ Seconds (must be within 2 minutes) _____ Pass _____ Fail

DATA SHEET 9 (Sheet 2 of 6)
MALFUNCTION WARNING TEST
(Test Number __1__)

Identify all other telltales and/or warning messages activated upon simulating subject ESC system malfunction. ESC, ABS, and Parking Brake telltales illuminated. Service Anti-Lock Brake System and Service Electronic Stability Control messages also displayed.

Did the malfunction telltale re-illuminate after the starting system was shut off for five minutes and then turned back on with the engine running?

__X__ Yes (Pass) _____No (Fail)

ESC SYSTEM RESTORATION:
Describe method used to restore system to normal operation:

Replace the 50A fuse.

After system restoration is completed, telltale extinguishes after vehicle starting system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12. D.

__X__ Yes _____No (Fail)

Telltale extinguished when engine was started, no driving required.

__X__ Yes (Pass) _____No

Driving was required to extinguish telltale. _____ Yes __X__No

When driving was required, telltale extinguished before vehicle speed of 48± 8 km/h (30± 5mph) was reached.

__X__NA _____ Yes (Pass) _____No

If driving required, approximate driving time below vehicle speed of 48± 8 km/h (30± 5mph) to extinguish telltale.

_____ Seconds

3.0 TEST DATA….continued

DATA SHEET 9 (Sheet 3 of 6)
MALFUNCTION WARNING TEST
(Test Number __1__)

When driving was required, telltale extinguished after a vehicle speed above 48± 8 km/h (30± 5mph) was reached.

__X__NA _____ Yes _____No

If driving required, time for telltale to extinguish after starting system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.

_____ Seconds (must be within 2 minutes) _____ Pass _____ Fail

DATA INDICATES COMPLIANCE: PASS/FAIL __PASS__

REMARKS:

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

3.0 TEST DATA….continued

DATA SHEET 9 (Sheet 4 of 6)
MALFUNCTION WARNING TEST
(Test Number __2__)

VEHICLE MAKE/MODEL/BODY STYLE: ____RAM / 1500 / Truck_____

VEHICLE NHTSA No.:___C20190303___ TEST DATE:_____7-24-19_____

METHOD OF MALFUNCTION SIMULATION:
Describe method of malfunction simulation:_____

_____Disconnect the left rear wheel speed sensor._____

MALFUNCTION TELLTALE ILLUMINATION:
Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12. B.

___X___ Yes _____No (Fail)

Telltale illuminated when engine was started, no driving required.

___X___ Yes (Pass) _____No

Driving was required to illuminate telltale. _____ Yes ___X___No

When driving was required, telltale illuminated before vehicle speed of 48± 8 km/h (30± 5mph) was reached.

___X___NA _____ Yes (Pass) _____No

If driving required, approximate driving time below vehicle speed of 48± 8 km/h (30± 5mph) to activate telltale.

_____ Seconds

When driving was required, telltale illuminated after a vehicle speed above 48± 8 km/h (30± 5mph) was reached.

___X___NA _____ Yes _____No

If driving required, time for telltale to illuminate after starting system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.

_____ Seconds (must be within 2 minutes) _____ Pass _____ Fail

3.0 TEST DATA….continued

DATA SHEET 9 (Sheet 5 of 6)
MALFUNCTION WARNING TEST
(Test Number __2__)

Identify all other telltales and/or warning messages activated upon simulating subject ESC system malfunction. ESC, ABS, and Parking Brake telltales illuminated. Service Anti-Lock Brake System, Service Electronic Stability Control, and 4WD System Temporarily Unavailable messages also displayed.

Did the malfunction telltale re-illuminate after the starting system was shut off for five minutes and then turned back on with the engine running?

__X__ Yes (Pass) _____ No (Fail)

ESC SYSTEM RESTORATION:
Describe method used to restore system to normal operation: Reconnect the left rear wheel speed sensor.

After system restoration is completed, telltale extinguishes after vehicle starting system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12. D.

__X__ Yes _____ No (Fail)

Telltale extinguished when engine was started, no driving required.

__X__ Yes (Pass) _____ No

Driving was required to extinguish telltale. _____ Yes __X__ No

When driving was required, telltale extinguished before vehicle speed of 48± 8 km/h (30± 5mph) was reached.

__X__ NA _____ Yes (Pass) _____ No

If driving required, approximate driving time below vehicle speed of 48± 8 km/h (30± 5mph) to extinguish telltale.

_____ Seconds

3.0 TEST DATA….continued

DATA SHEET 9 (Sheet 6 of 6)
MALFUNCTION WARNING TEST
(Test Number __2__)

When driving was required, telltale extinguished after a vehicle speed above 48± 8 km/h (30± 5mph) was reached.

___X___NA _____ Yes _____No

If driving required, time for telltale to extinguish after starting system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.

_____ Seconds (must be within 2 minutes) _____ Pass _____ Fail

DATA INDICATES COMPLIANCE: PASS/FAIL ___PASS____

REMARKS:

RECORDED BY: __David Karls_____ DATE:_____7-30-19____
APPROVED BY: __Jordan Piening_____ DATE:_____7-30-19____

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

Type	Output	Range	Resolution	Accuracy	Specifics	Serial Number	Calibration
Tire Pressure Gauge	Vehicle Tire Pressure	0-99 psi	0.01 psi	±0.5% of applied pressure	Intercomp 360045-150-BC	AG-0422SS08645	By: TRC Inc. Date: 6-10-19 Due: 12-10-19
Platform Scales	Vehicle Total, Wheel, and Axle Load	0-2500 lb per each of four pads	0.5 lb	±1.0% of applied load	Mettler Toledo Model: JXGA1000	5225831-5JC	By: Mettler Toledo Date: 5-29-19 Due: 8-30-19
Automated Steering Machine with Steering Angle Encoder	Handwheel Angle	±800 deg	0.25 deg	±0.25 deg	Heitz Automotive Testing Model: Sprint 3	60303	By: ATI-Heitz Date: 2-1-19 Due: 2-1-20
Multi-Axis Inertial Sensing System	Longitudinal, Lateral, and Vertical Acceleration Roll, Yaw, and Pitch Rate	Accelerometers: ±2 g Angular Rate Sensors: ±100 deg/s	Accelerometers: ≤10 ug Angular Rate Sensors: ≤0.004 deg/s	Accelerometers: ≤0.05% of full range Angular Rate Sensors: 0.05% of full range	BEI Technologies Model: MotionPAK MP-1	0767	By: BEI Tech. Date: 1-30-19 Due: 1-30-20
Radar Speed Sensor and Dashboard Display	Vehicle Speed	0-125 mph	0.009 mph	±0.25% of full scale	A-DAT Corp. Radar Model: DRS-6 Display Model: RD-2	1400603	By: TRC Inc. Date: 5-20-19 Due: 5-20-20
Laser Height / Body Roll Measuring System	Left and Right Side Vehicle Height	150 to 900 mm	0.3 mm	±0.3%	Kistler Model: HF-750C	078-11249 & 078-11250	By: TRC Inc. Date: 3-13-19 Due: 3-13-20
Data Acquisition System [Amplify, Anti-Alias, and Digitize]	Record Time; Velocity; Distance; Lateral, Longitudinal, and Vertical Accelerations; Roll, Yaw, and Pitch Rates; Steering Wheel Angle.	Sufficient to meet or exceed individual sensors	200 Hz	Sufficient to meet or exceed individual sensors	Dewetron Sidehand DAS Model: DA-121 Digitizer Model: Dewe-Orion-1616-100 Amplifier/AntiAliasing: MDAQ-FILT-10-S	101031009	By: TRC Inc. Date: 3-20-19 Due: 3-20-20
Load Cell	Vehicle Brake Pedal Force	0-300 lb	1 lb	±0.05% of full scale	DATRON Model: DTM-LPA	4970-1103	By: TRC Inc. Date: per test Due: per test
Coordinate Measurement Machine	Inertial Sensing System Location	0-10 feet	0.001 inch	±0.003% of full scale	FARO International Model: Faro Advantage	C12-05-06-04829	By: FARO Date: 9-19-18 Due: 9-19-19
Outriggers	No output. Safety Item.	N/A	N/A	N/A	NHTSA Titanium Outriggers Model: Docket 2007-27662-11	Asset ID: 70725	N/A
Weather Station	Temperature and Wind Speed	-40-150°F 0-200mph	0.1°F 1mph	±1°F ±2mph	Davis Instruments Vantage Pro2	070817N01	By: Davis Inst. Date: 4-1-19 Due: 4-1-20

5.0 PHOTOGRAPHS

5.1 ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE
5.2 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE
5.3 VEHICLE CERTIFICATION LABEL
5.4 TIRE AND LOADING INFORMATION LABEL
5.5 WINDOW STICKER (MONRONEY LABEL)
5.6 ESC OFF AND ESC MALFUNCTION TELLTALES
5.7 ESC OFF CONTROL LOCATION
5.8 ESC OFF CONTROL
5.9 ¾ FRONT VIEW - TEST VEHICLE INSTRUMENTED
5.10 ¾ REAR VIEW - TEST VEHICLE INSTRUMENTED
5.11 STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM
5.12 STEERING CONTROLLER BATTERY BOX
5.13 INERTIA MEASUREMENT UNIT
5.14 VEHICLE SPEED SENSOR
5.15 BODY ROLL SENSOR (DRIVER SIDE)
5.16 BODY ROLL SENSOR (PASSENGER SIDE)
5.17 BRAKE PEDAL FORCE TRANSDUCER

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

5.1 ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

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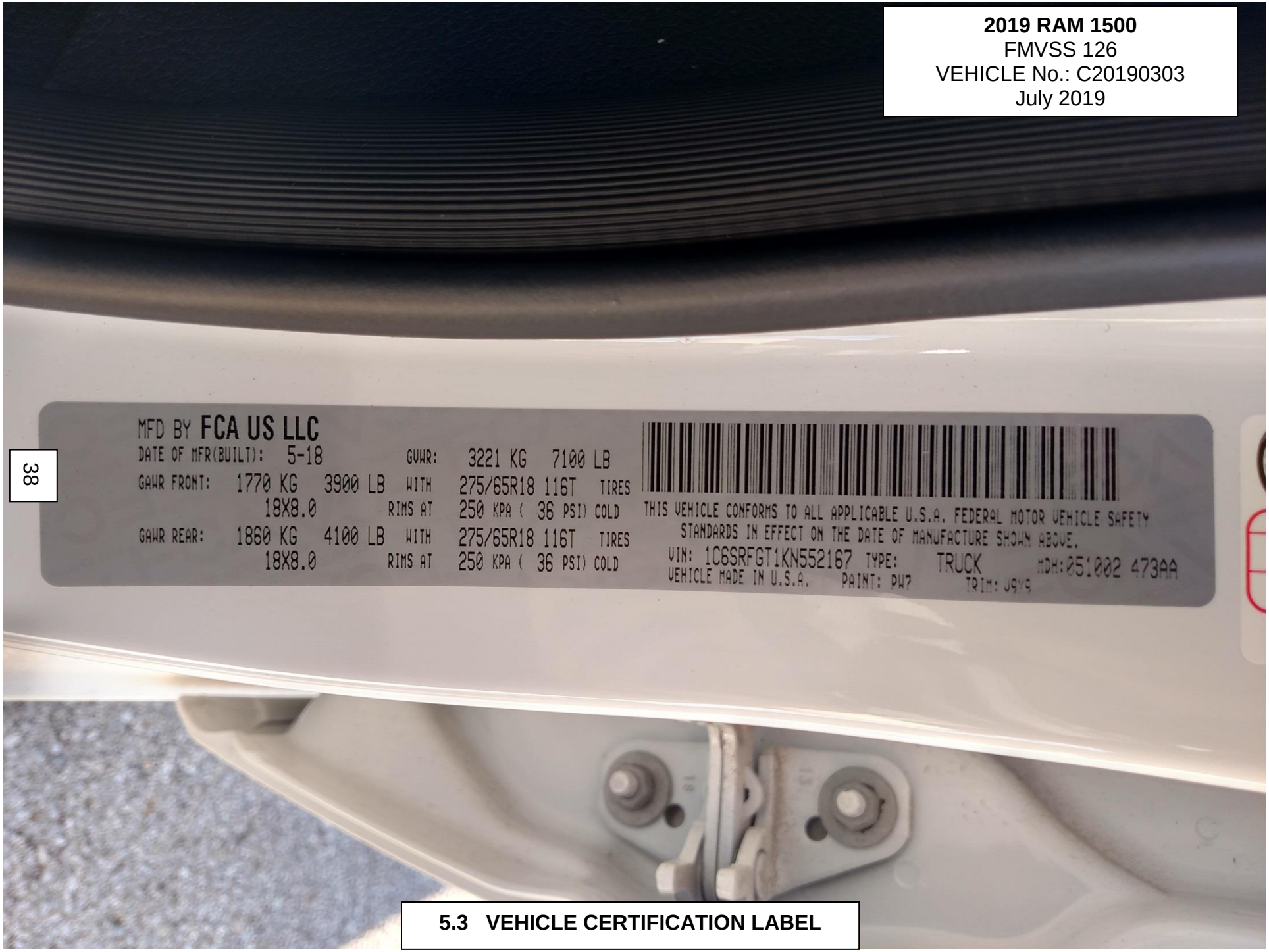
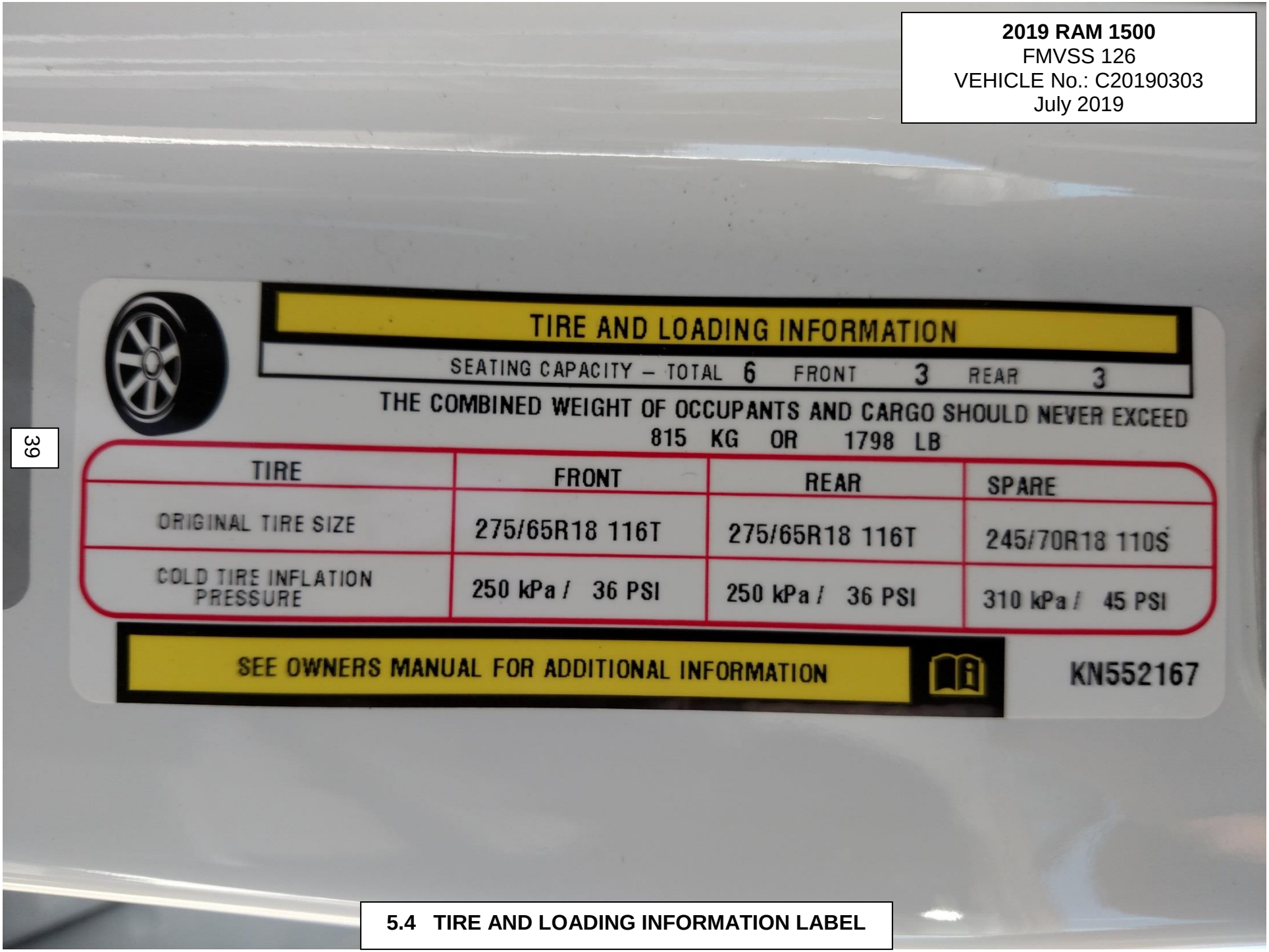
5.2 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019



5.3 VEHICLE CERTIFICATION LABEL

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019



5.4 TIRE AND LOADING INFORMATION LABEL

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

RAM

2019 MODEL YEAR

RAM 1500 TRADESMAN CREW CAB 4X4

For more information visit: www.ramtrucks.com
or call 1-866-RAMINFO

FCA US LLC

THIS VEHICLE IS MANUFACTURED TO MEET SPECIFIC UNITED STATES REQUIREMENTS. THIS VEHICLE IS NOT MANUFACTURED FOR SALE OR REGISTRATION OUTSIDE OF THE UNITED STATES.

MANUFACTURER'S SUGGESTED RETAIL PRICE OF THIS MODEL INCLUDING DEALER PREPARATION

Base Price: $37,995

RAM 1500 TRADESMAN CREW CAB 4X4
Exterior Color: Bright White Clear-Coat Exterior Paint
Interior Color: Black Interior Color
Interior: Cloth 40 / 20 / 40 Bench Seat
Engine: 5.7-Liter V8 HEMI® MDS VVT Engine
Transmission: 8-Speed Automatic 8HP75 Transmission

STANDARD EQUIPMENT (UNLESS REPLACED BY OPTIONAL EQUIPMENT)

FUNCTIONAL/SAFETY FEATURES
- Advanced Multistage Front Air Bags
- Supplemental Front Seat Side Air Bags
- Supplemental Side-Curtain Front / Rear Air Bags
- 3.21 Rear Axle Ratio
- Keyless Go™
- Remote Keyless Entry with All-Secure
- Parkview® Rear Back-Up Camera
- Sentry Key® Theft Deterrent System
- 4-Wheel Disc Anti-Lock Brakes
- Electric Park Brake
- Ready-Alert Braking
- Rain Brake Support
- Tire-Fill Alert
- Electronic Roll Mitigation
- Electronic Stability Control
- Trailer Sway Damping
- Hill Start Assist
- Speed Control
- Black Rotary Shifter
- Class III Receiver-Hitch
- 7-Pin Wiring Harness
- Capless Fuel-Fill

INTERIOR FEATURES
- Uconnect® 3 with 5-Inch Display
- Cluster 3.5-Inch TFT B&W Display
- Integrated Voice Command with Bluetooth®
- Media Hub-2 USB, Full Function, Aux
- 12-Volt Auxiliary Power Outlet
- 6-Speakers
- 4-Way Manual Adjustable Driver Seat
- Front Passenger Seat - Manual Adjust 4-Way
- 2nd-Row In-Floor Storage Bins
- Power Windows w/ Front 1-Touch Up and Down Feature
- Front / Rear Climate-Control Outlets
- Steering Wheel Mounted Shift Control
- Tilt/Telescope Steering Column

EXTERIOR FEATURES
- 18.0-Inch x 7.5-Inch Steel Painted Wheels
- 275/65R18 BSW All-Season Tires
- 18-Inch Full Size Steel Spare Wheel
- Power-Heated Mirrors with Manual Fold-Away
- Automatic Headlamps
- Halogen Quad Headlamps
- Cargo Tie-Down Loops
- Locking Tailgate

OPTIONAL EQUIPMENT (May Replace Standard Equipment)

Customer Preferred Package 25A	
Chrome Appearance Group	$995
18.0-Inch x 8.0-Inch Premium Paint Cast Wheels	
Bright Front Bumper	
Bright Rear Bumper	
Tradesman Chrome Grille	
Level 1 Equipment Group	$1,555
Cloth 40 / 20 / 40 Bench Seat	
Front and Rear Floor Mats	
Carpet Floor Covering	
Rear Power Sliding-Window	
SiriusXM® Sat Radio w/ 1-Yr Sub Call 800-643-2112	
Three Rear Seat Head Restraints	
Anti-Spin Differential Rear Axle	$435
5.7-Liter V8 HEMI® MDS VVT Engine	$1,195
Active Noise-Control System	
Class IV Receiver-Hitch	$345
DESTINATION CHARGE	**$1,645**

TOTAL PRICE: * $44,165

WARRANTY COVERAGE
5-year or 60,000-mile Powertrain Limited Warranty.
3-year or 36,000-mile Basic Limited Warranty.
Ask Dealer for a copy of the limited warranties or see your owner's manual for details.

5 YEAR / 60,000 MILE
POWERTRAIN WARRANTY

Assembly Point/Port of Entry: STERLING HTS, MICH., U.S.A.

VIN: 1C6-SRFGT1KN-552167 L4-VON: 6644 0512

SHIPTO: 45626 38
FINDLAY CHRYSLER DODGE JEEP RAM
10305 STATE ROUTE 224 W
FINDLAY OH 45840-1933

SOLDTO: 42 45626
FINDLAY CHRYSLER DODGE JEEP RAM
10305 STATE ROUTE 224 W
FINDLAY OH 45840-1933

THIS LABEL IS ADDED TO THIS VEHICLE TO COMPLY WITH FEDERAL LAW. THE LABEL CANNOT BE REMOVED OR ALTERED PRIOR TO DELIVERY TO THE ULTIMATE PURCHASER.

* STATE AND/OR LOCAL TAXES IF ANY, LICENSE AND TITLE FEES AND DEALER SUPPLIED AND INSTALLED OPTIONS AND ACCESSORIES ARE NOT INCLUDED IN THIS PRICE. DISCOUNT, IF ANY, IS BASED ON PRICE OF OPTIONS IF PURCHASED SEPARATELY.

EPA DOT Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy
17 MPG combined city/hwy
15 city 21 highway
5.9 gallons per 100 miles

These estimates reflect new EPA methods beginning with 2017 models.
Standard pickups range from 14 to 22 MPG.
The best vehicle rates 136 MPGe.

You **spend $5,250** more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $2,450

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 3 (1 – 10, Best)

Smog Rating (tailpipe only): 5 (1 – 10, Best)

This vehicle emits 523 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at fueleconomy.gov

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and cost $7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.80 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code™

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 57%
MAJOR SOURCES OF FOREIGN PARTS CONTENT:
MEXICO: 28%
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE:
FINAL ASSEMBLY POINT:
STERLING HTS, MICH., U.S.A.
COUNTRY OF ORIGIN:
ENGINE: MEXICO
TRANSMISSION: UNITED STATES

MOPAR VEHICLE PROTECTION
A PRODUCT OF FCA US LLC
Ask for Mopar Vehicle Protection for your vehicle. We Built It. We Back It.

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5.5 WINDOW STICKER - MONRONEY LABEL

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5.6 ESC OFF AND ESC MALFUNCTION TELLTALES

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

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5.7 ESC OFF CONTROL LOCATION

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

5.8 ESC OFF CONTROL

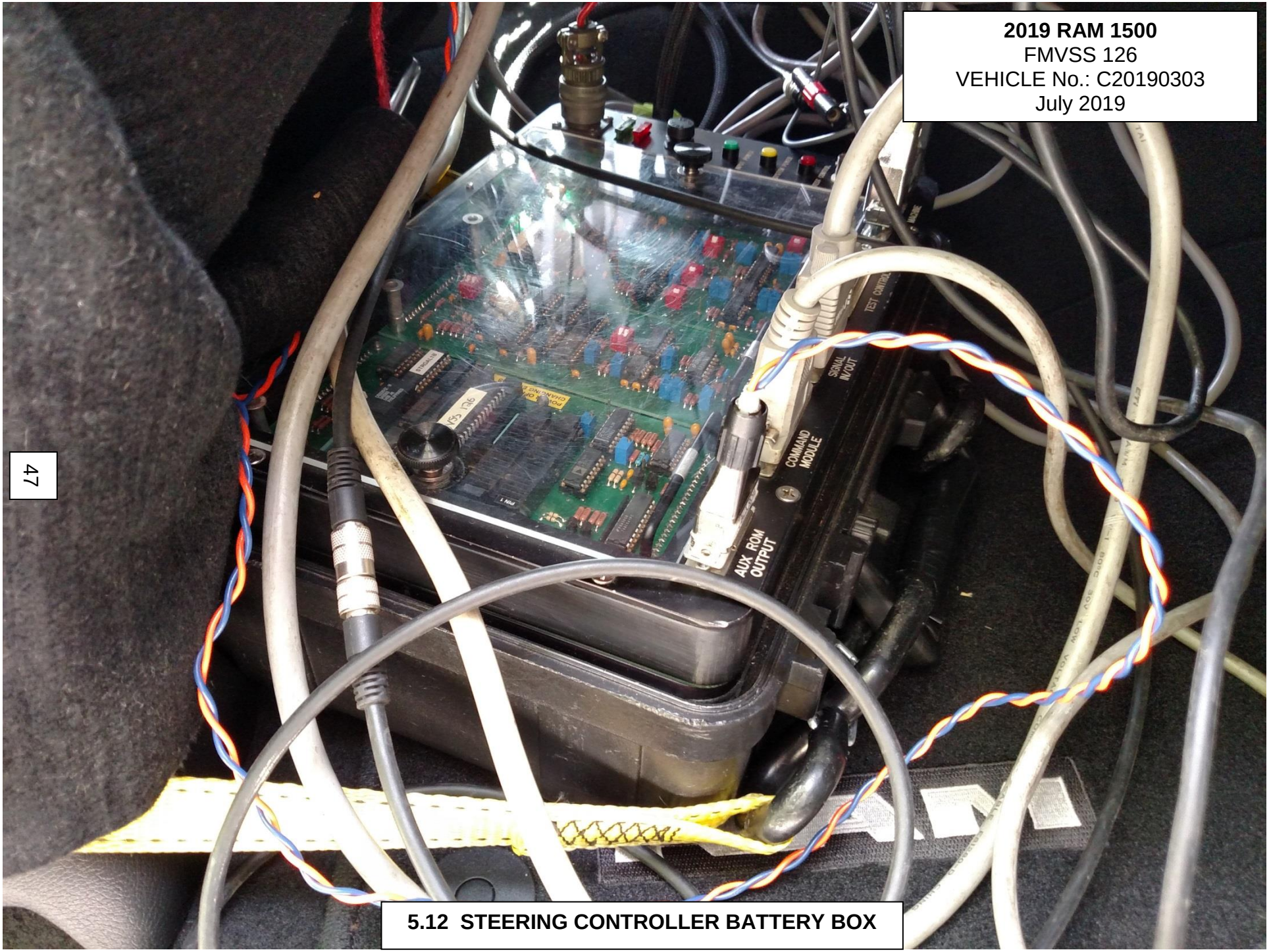
5.9 ¾ FRONT VIEW - TEST VEHICLE INSTRUMENTED

5.10 ¾ REAR VIEW - TEST VEHICLE INSTRUMENTED

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

5.11 STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019



5.12 STEERING CONTROLLER BATTERY BOX

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

5.13 INERTIA MEASUREMENT UNIT


2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019
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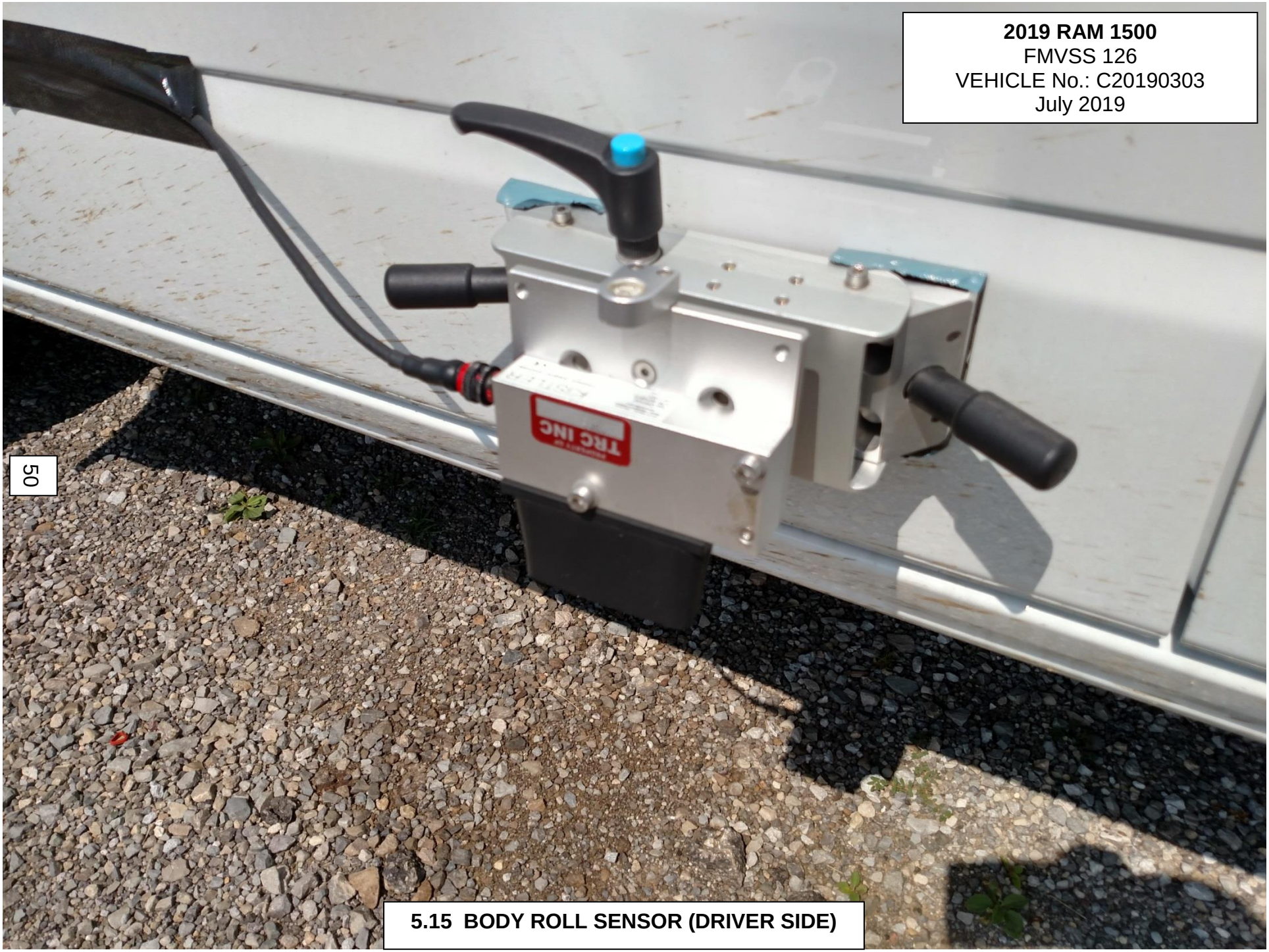
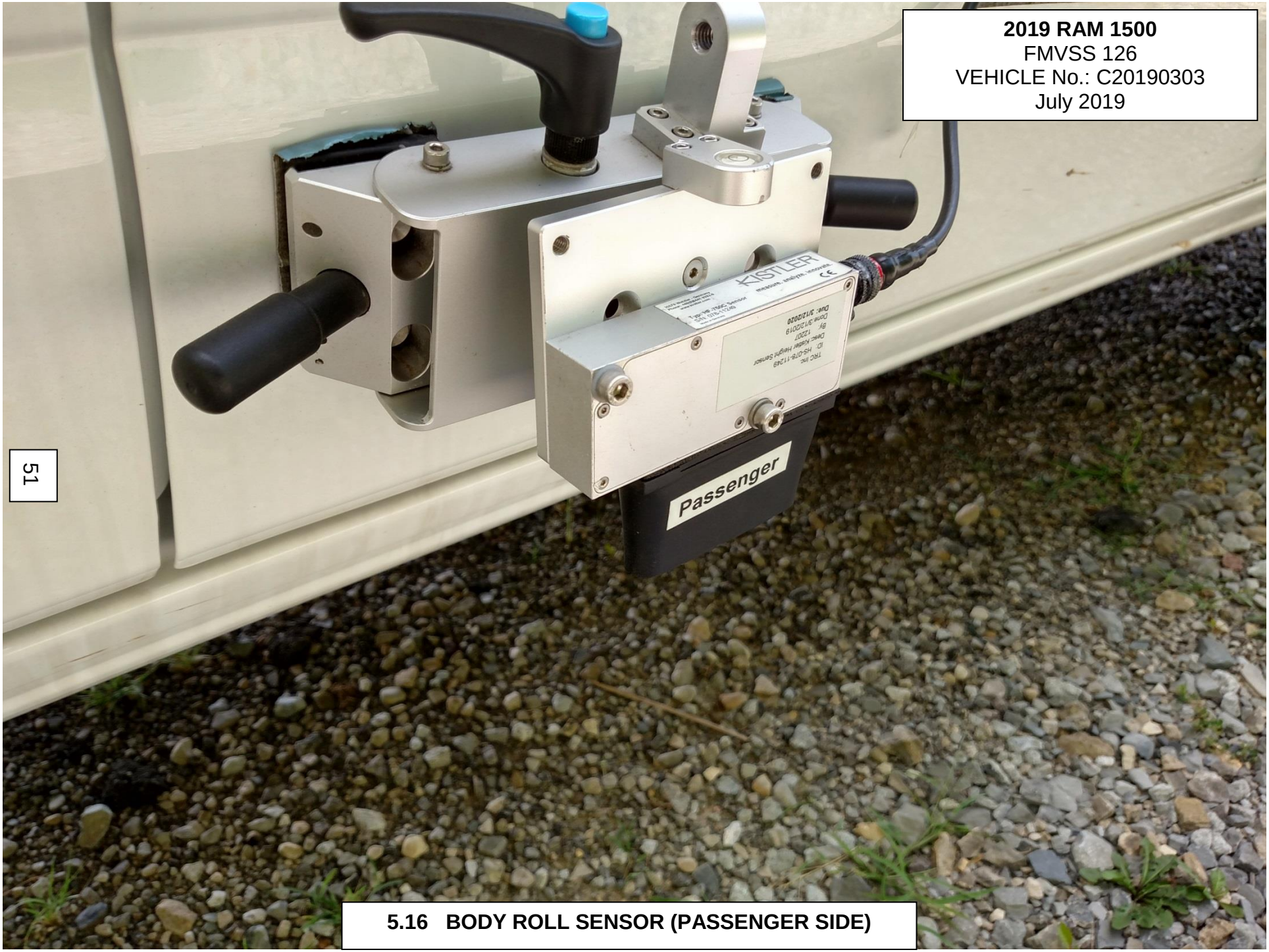
5.14 VEHICLE SPEED SENSOR

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019



5.15 BODY ROLL SENSOR (DRIVER SIDE)

2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019



5.16 BODY ROLL SENSOR (PASSENGER SIDE)

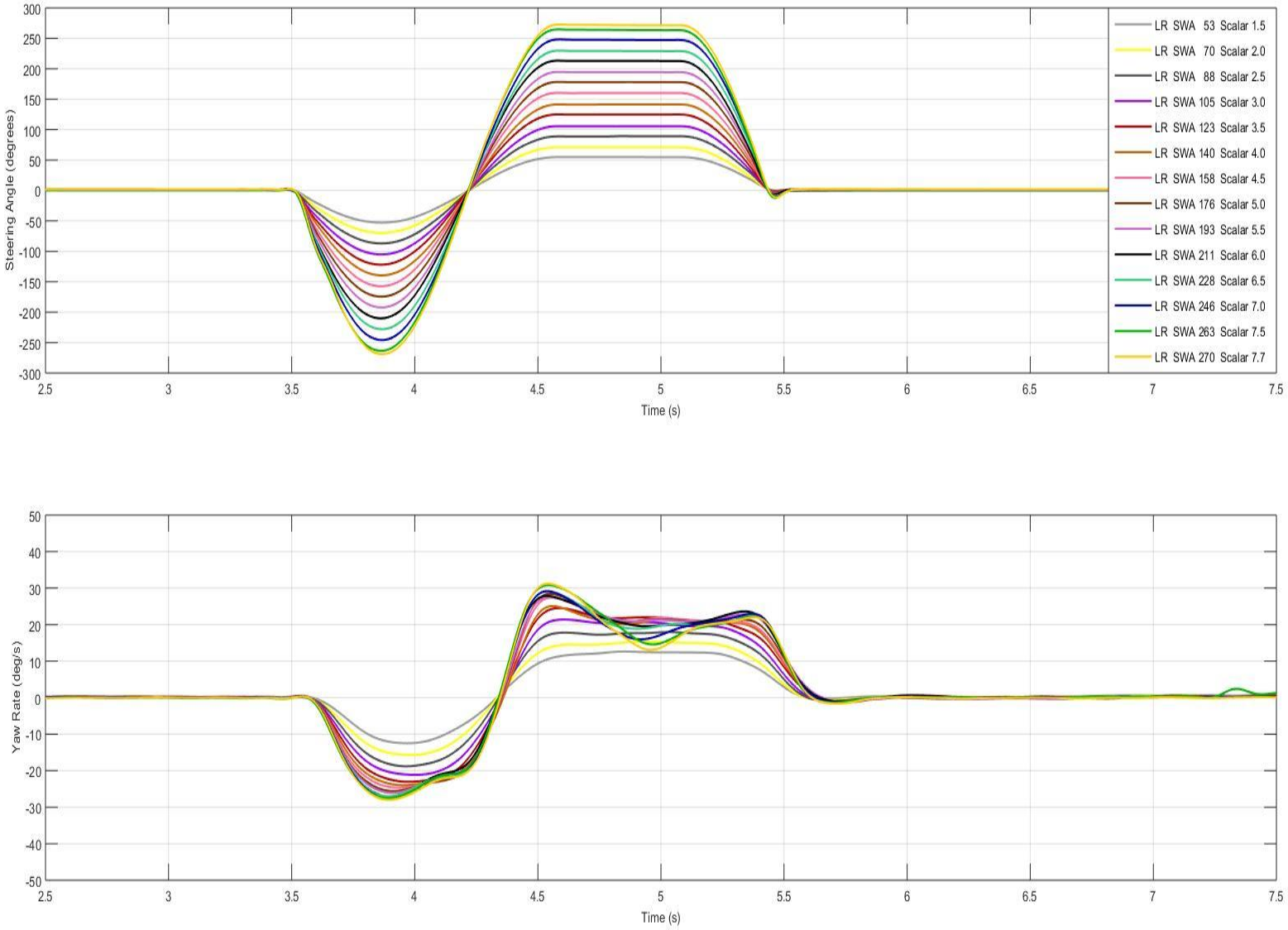
2019 RAM 1500
FMVSS 126
VEHICLE No.: C20190303
July 2019

5.17 BRAKE PEDAL FORCE TRANSDUCER

6.0 DATA PLOTS

6.0 2019 RAM 1500 DATA PLOTS

Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests



6.0 2019 RAM 1500 DATA PLOTS …continued

Figure 2. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

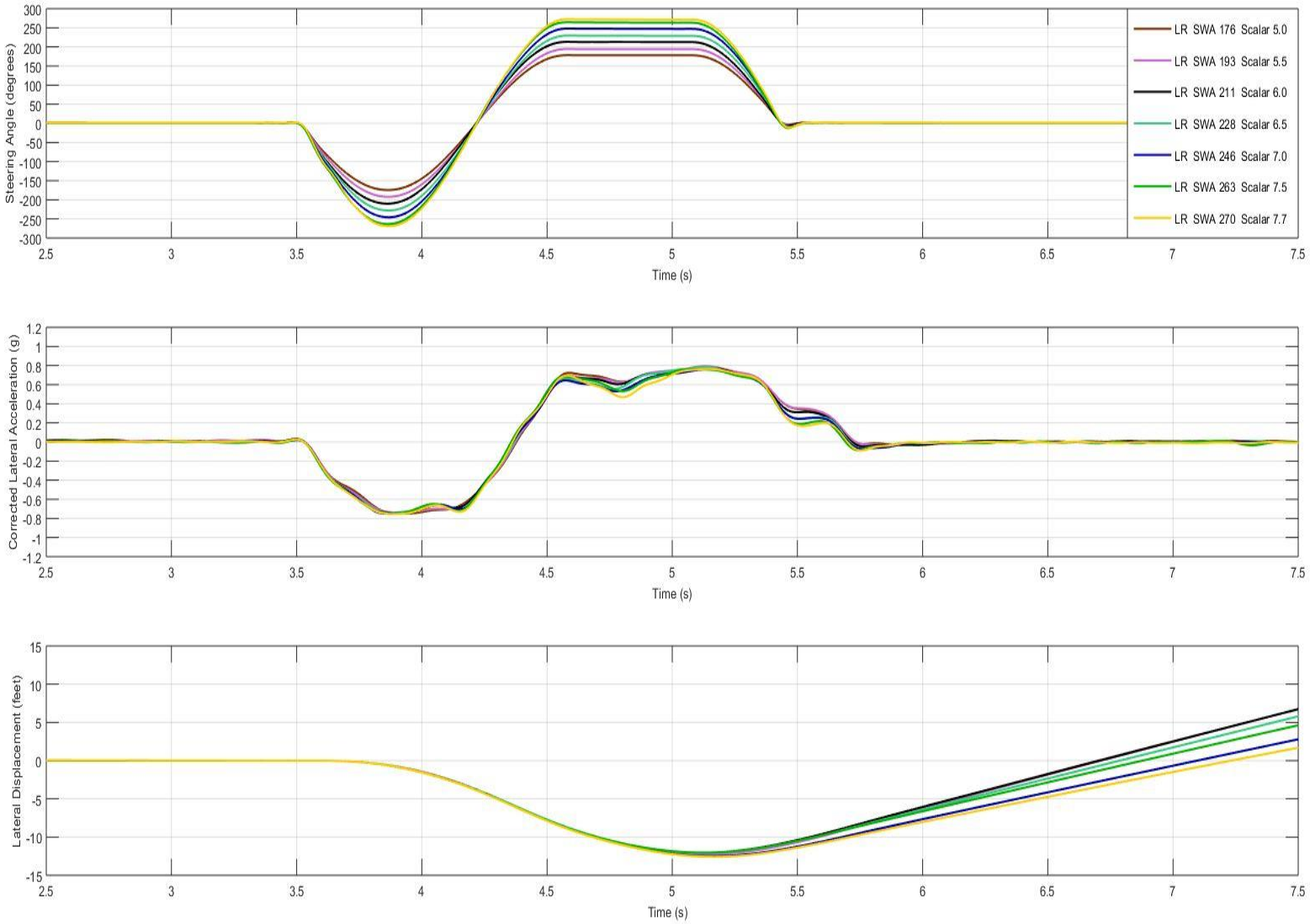
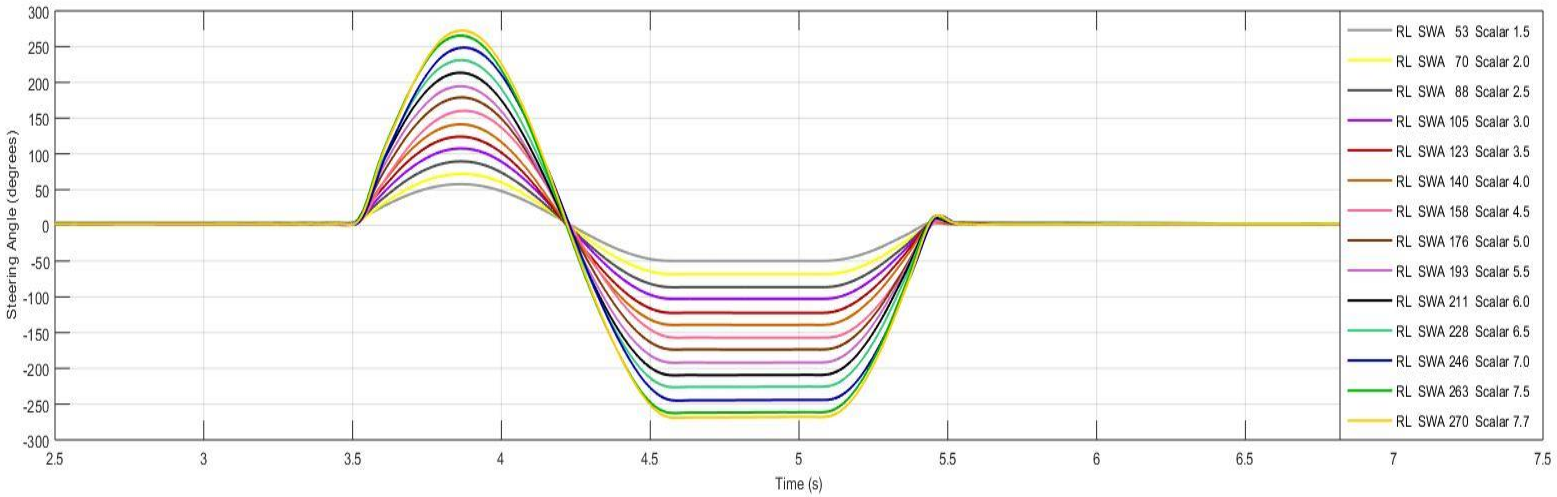
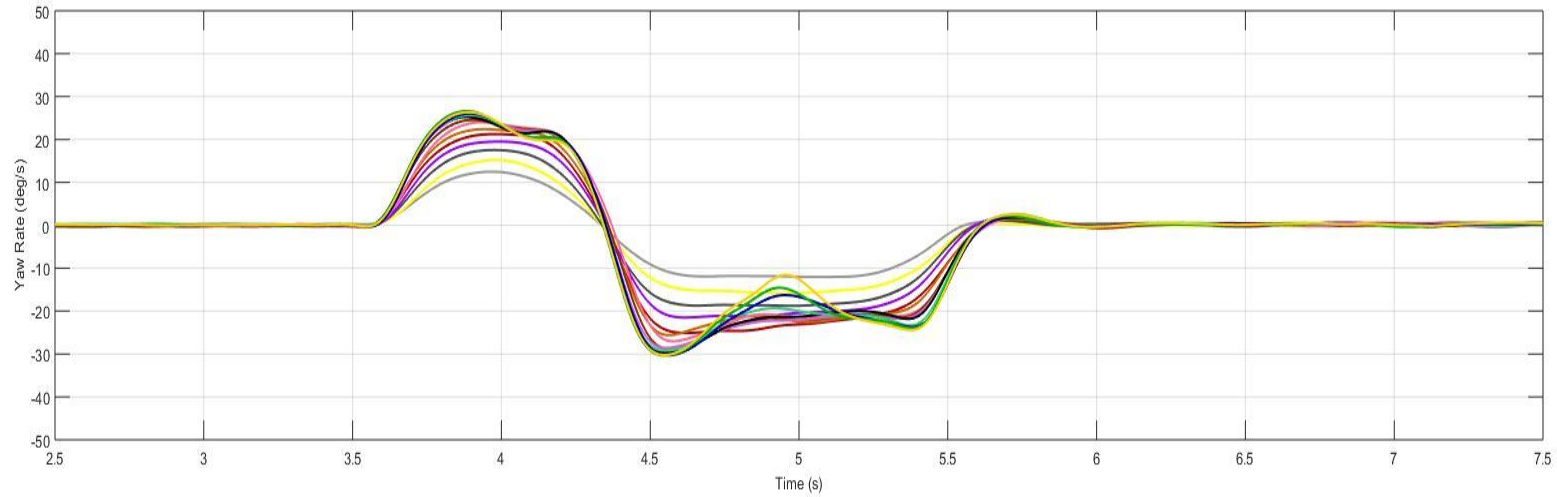


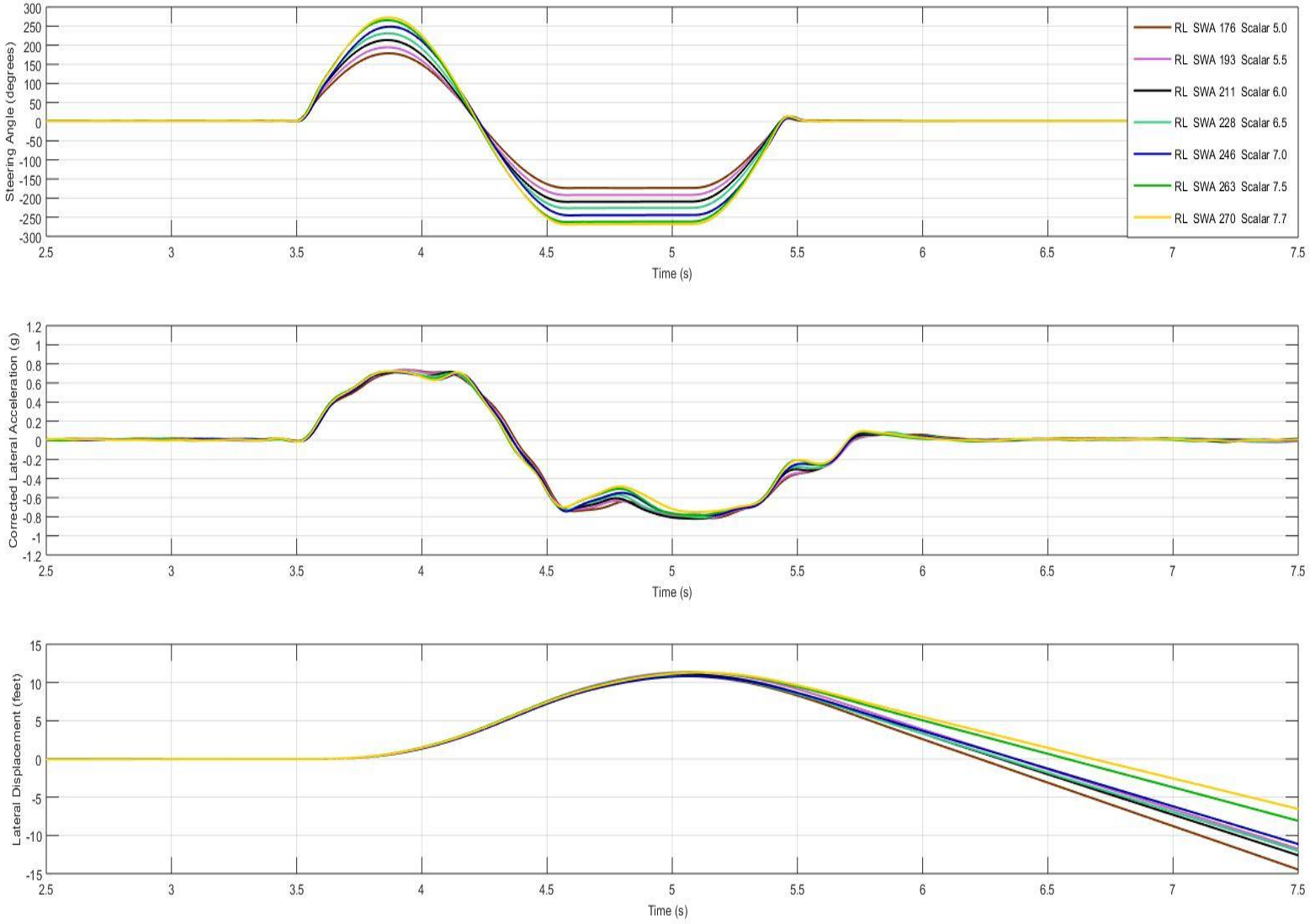
Figure 3. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests





6.0 2019 RAM 1500 DATA PLOTS …continued

Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests



7.0 OTHER DOCUMENTATION

7.1 OWNER'S MANUAL PAGES
7.2 VEHICLE ARRIVAL CONDITION REPORT
7.3 VEHICLE COMPLETION CONDITION REPORT
7.4 SINE WITH DWELL TEST RESULTS
7.5 SLOWLY INCREASING STEER TEST RESULTS
7.6 INERTIA SENSOR MEASUREMENTS

7.1 OWNER'S MANUAL PAGES

8. Turn the ignition to the OFF mode and then back to ON. If the sequence was completed properly, the "ESC Off Indicator Light" will blink several times to confirm HSA is disabled.
9. Repeat these steps if you want to return this feature to its previous setting.

Traction Control System (TCS)

This system monitors the amount of wheel spin of each of the driven wheels. If wheel spin is detected, the TCS may apply brake pressure to the spinning wheel(s) and/or reduce engine power to provide enhanced acceleration and stability. A feature of the TCS, Brake Limited Differential (BLD), functions similar to a limited slip differential and controls the wheel spin across a driven axle. If one wheel on a driven axle is spinning faster than the other, the system will apply the brake of the spinning wheel. This will allow more engine torque to be applied to the wheel that is not spinning. BLD may remain enabled even if TCS and ESC are in a reduced mode.

Electronic Stability Control (ESC)

This system enhances directional control and stability of the vehicle under various driving conditions. ESC corrects for oversteering or understeering of the vehicle by applying the brake of the appropriate wheel(s) to assist in counteracting the oversteer or understeer condition. Engine power may also be reduced to help the vehicle maintain the desired path.

ESC uses sensors in the vehicle to determine the vehicle path intended by the driver and compares it to the actual path of the vehicle. When the actual path does not match the intended path, ESC applies the brake of the appropriate wheel to assist in counteracting the oversteer or understeer condition.

- Oversteer — when the vehicle is turning more than appropriate for the steering wheel position.
- Understeer — when the vehicle is turning less than appropriate for the steering wheel position.

The "ESC Activation/Malfunction Indicator Light" located in the instrument cluster will start to flash as soon as the ESC system becomes active. The "ESC Activation/Malfunction Indicator Light" also flashes when the TCS is active. If the "ESC Activation/

7.1 OWNER'S MANUAL PAGES

Malfunction Indicator Light" begins to flash during acceleration, ease up on the accelerator and apply as little throttle as possible. Be sure to adapt your speed and driving to the prevailing road conditions.

WARNING!

- **Electronic Stability Control (ESC) cannot prevent the natural laws of physics from acting on the vehicle, nor can it increase the traction afforded by prevailing road conditions. ESC cannot prevent accidents, including those resulting from excessive speed in turns, driving on very slippery surfaces, or hydroplaning. ESC also cannot prevent accidents resulting from loss of vehicle control due to inappropriate driver input for the conditions. Only a safe, attentive, and skillful driver can prevent accidents. The capabilities of an ESC equipped vehicle must never be exploited in a reckless or dangerous manner which could jeopardize the user's safety or the safety of others.**
- **Vehicle modifications, or failure to properly maintain your vehicle, may change the handling**

(Continued)

WARNING! *(Continued)*

characteristics of your vehicle, and may negatively affect the performance of the ESC system. Changes to the steering system, suspension, braking system, tire type and size or wheel size may adversely affect ESC performance. Improperly inflated and unevenly worn tires may also degrade ESC performance. Any vehicle modification or poor vehicle maintenance that reduces the effectiveness of the ESC system can increase the risk of loss of vehicle control, vehicle rollover, personal injury and death.

ESC Operating Modes

NOTE: Depending upon model and mode of operation, the ESC system may have multiple operating modes.

ESC On

This is the normal operating mode for the ESC. Whenever the vehicle is started, the ESC system will be in this mode. This mode should be used for most driving conditions. Alternate ESC modes should only be used for specific reasons as noted in the following paragraphs.

7.1 OWNER'S MANUAL PAGES

Partial Off

The "Partial Off" mode is intended for times when a more spirited driving experience is desired. This mode may modify TCS and ESC thresholds for activation, which allows for more wheel spin than normally allowed. This mode may be useful if the vehicle becomes stuck.

To enter the "Partial Off" mode, momentarily push the "ESC Off" switch and the "ESC Off Indicator Light" will illuminate. To turn the ESC on again, momentarily push the "ESC Off" switch and the "ESC Off Indicator Light" will turn off.

NOTE: For vehicles with multiple partial ESC modes a momentary button push will toggle the ESC mode. Multiple momentary button pushed may be required to return to ESC On.

WARNING!

- **When in "Partial Off" mode, the TCS functionality of ESC, (except for the limited slip feature described in the TCS section), has been disabled**

(Continued)

WARNING! *(Continued)*

and the "ESC Off Indicator Light" will be illuminated. When in "Partial Off" mode, the engine power reduction feature of TCS is disabled, and the enhanced vehicle stability offered by the ESC system is reduced.
- **Trailer Sway control (TSC) is disabled when the ESC system is in the "Partial Off" mode.**

Full Off — If Equipped

This mode is intended for off-highway or off-road use only and should not be used on any public roadways. In this mode, TCS and ESC features are turned OFF. To enter the "Full Off" mode, push and hold the "ESC Off" switch for five seconds while the vehicle is stopped with the engine running. After five seconds, a chime will sound, the "ESC Off Indicator Light" will illuminate, and the "ESC OFF" message will display in the instrument cluster. To turn ESC ON again, momentarily push the "ESC Off" switch.

NOTE: System may switch from ESC "Full Off" to "Partial Off" mode when vehicle exceeds a predetermined speed. When the vehicle speed slows below the predetermined speed the system will return to ESC "Full Off".

ESC modes may also be affected by drive modes if so equipped.

WARNING!

- **In the ESC "Full Off" mode, the engine torque reduction and stability features are disabled. Therefore, enhanced vehicle stability offered by the ESC system is unavailable. In an emergency evasive maneuver, the ESC system will not engage to assist in maintaining stability. ESC "Full Off" mode is intended for off-highway or off-road use only.**
- **With the ESC switched off, the enhanced vehicle stability offered by ESC is unavailable. In an emergency evasive maneuver, the ESC system will not engage to assist in maintaining stability. ESC "Full Off" mode is only intended for off-highway or off-road use.**

(Continued)

WARNING! *(Continued)*

- **The Electronic Stability Control (ESC) cannot prevent the natural laws of physics from acting on the vehicle, nor can it increase the traction afforded by prevailing road conditions. ESC cannot prevent all accidents, including those resulting from excessive speed in turns, driving on very slippery surfaces, or hydroplaning. ESC also cannot prevent collisions.**

ESC Activation/Malfunction Indicator Light and ESC OFF Indicator Light

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The "ESC Activation/Malfunction Indicator Light" in the instrument cluster will come on when the ignition is turned to the ON mode. It should go out with the engine running. If the "ESC Activation/Malfunction Indicator Light" comes on continuously with the engine running, a malfunction has been detected in the ESC system. If this light remains on after several ignition cycles, and the vehicle has been driven several miles (kilometers) at

7.1 OWNER'S MANUAL PAGES

speeds greater than 30 mph (48 km/h), see your authorized dealer as soon as possible to have the problem diagnosed and corrected.

The "ESC Activation/Malfunction Indicator Light" (located in the instrument cluster) starts to flash as soon as the tires lose traction and the ESC system becomes active. The "ESC Activation/Malfunction Indicator Light" also flashes when TCS is active. If the "ESC Activation/Malfunction Indicator Light" begins to flash during acceleration, ease up on the accelerator and apply as little throttle as possible. Be sure to adapt your speed and driving to the prevailing road conditions.

NOTE:

- The "ESC Activation/Malfunction Indicator Light" and the "ESC OFF Indicator Light" come on momentarily each time the ignition is turned ON.
- Each time the ignition is turned ON, the ESC system will be on even if it was turned off previously.
- The ESC system will make buzzing or clicking sounds when it is active. This is normal; the sounds will stop when ESC becomes inactive following the maneuver that caused the ESC activation.

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The "ESC OFF Indicator Light" indicates the customer has elected to have the Electronic Stability Control (ESC) in a reduced mode.

Electronic Roll Mitigation (ERM)

This system anticipates the potential for wheel lift by monitoring the driver's steering wheel input and the speed of the vehicle. When ERM determines that the rate of change of the steering wheel angle and vehicle's speed are sufficient to potentially cause wheel lift, it then applies the appropriate brake and may also reduce engine power to lessen the chance that wheel lift will occur. ERM can only reduce the chance of wheel lift occurring during severe or evasive driving maneuvers; it cannot prevent wheel lift due to other factors, such as road conditions, leaving the roadway, or striking objects or other vehicles.

7.1 OWNER'S MANUAL PAGES

NOTE: ERM is disabled anytime the ESC is in "Full Off" mode (if equipped). Refer to "Electronic Stability Control (ESC)" in this section for a complete explanation of the available ESC modes.

WARNING!

Many factors, such as vehicle loading, road conditions and driving conditions, influence the chance that wheel lift or rollover may occur. ERM cannot prevent all wheel lift or roll overs, especially those that involve leaving the roadway or striking objects or other vehicles. The capabilities of an ERM-equipped vehicle must never be exploited in a reckless or dangerous manner which could jeopardize the user's safety or the safety of others.

Trailer Sway Control (TSC)

TSC uses sensors in the vehicle to recognize an excessively swaying trailer and will take the appropriate actions to attempt to stop the sway. TSC will become active automatically once an excessively swaying trailer is recognized.

NOTE: TSC cannot stop all trailers from swaying. Always use caution when towing a trailer and follow the trailer tongue weight recommendations. Refer to "Trailer Towing" in "Starting And Operating" for further information.

When TSC is functioning, the "ESC Activation/ Malfunction Indicator Light" will flash, the engine power may be reduced and you may feel the brakes being applied to individual wheels to attempt to stop the trailer from swaying. TSC is disabled when the ESC system is in the "Partial Off" or "Full Off" modes.

WARNING!

If TSC activates while driving, slow the vehicle down, stop at the nearest safe location, and adjust the trailer load to eliminate trailer sway.

Hill Descent Control (HDC) — If Equipped

HDC is intended for low speed off road driving while in 4WD Low Range. HDC maintains vehicle speed while descending hills during various driving situations. HDC controls vehicle speed by actively controlling the brakes.

HDC has three states:

7.1 OWNER'S MANUAL PAGES

7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO. DTNH22-16-D-00027 DATE: 7-8-19

FROM: Automotive Allies

TO: TRC Inc.

PURPOSE: (X) Initial Receipt ( ) Received via Transfer ( ) Present vehicle condition

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2019 / RAM / 1500 / Truck

MANUFACTURE DATE: 05-18 NHTSA NO.: C20190303

BODY COLOR: White VIN: 1C6SRFGT1KN552167

ODOMETER READING: 35 miles GVWR: 3,221 KG

PURCHASE PRICE: $ rented / leased DEALER'S NAME: Findlay Chrysler Dodge Jeep Ram, 10305 St Rt. 224W, Findlay, OH

X ALL OPTIONS LISTED ON "WINDOW STICKER" ARE PRESENT ON THE TEST VEHICLE

X TIRES AND WHEEL RIMS ARE NEW AND THE SAME AS LISTED

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY PREPARED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

X PLACE VEHICLE IN STORAGE AREA

X INSPECT THE VEHICLE'S INTERIOR AND EXTERIOR, INCLUDING ALL WINDOWS, SEATS, DOORS, ETC., TO CONFIRM THAT EACH SYSTEM IS COMPLETE AND FUNCTIONAL PER THE MANUFACTURER'S SPECIFICATIONS. ANY DAMAGE, MISADJUSTMENT, OR OTHER UNUSUAL CONDITION THAT COULD INFLUENCE THE TEST PROGRAM OR TEST RESULTS SHALL BE RECORDED. REPORT ANY ABNORMAL CONDITION TO THE NHTSA COTR BEFORE BEGINNING ANY TEST

RECORDED BY: David Karls DATE: 7-30-19

APPROVED BY: Jordan Piening DATE: 7-30-19

7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO. DTNH22-16-D-00027 DATE: 7-26-19

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2019 / RAM / 1500 / Truck

MANUFACTURE DATE: 05-18 NHTSA NO.: C20190303

BODY COLOR: White VIN: 1C6SRFGT1KN552167

ODOMETER READING: 84 miles GVWR: 3,221 KG

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: 126, 135

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY MAINTAINED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

REMARKS:

Equipment that is no longer on the test vehicle as noted on Vehicle Arrival Condition Report:

None.

Explanation for equipment removal:

N/A

Test Vehicle Condition:

Like new.

RECORDED BY: David Karls DATE: 7-30-19
APPROVED BY: Jordan Piening DATE: 7-30-19

7.4 SINE WITH DWELL TEST RESULTS

2019 RAM 1500

NHTSA No.: C20190303

Date Created 24-Jul-19

LEFT-TO-RIGHT (INITIAL COUNTER-CLOCKWISE STEER)

File	SWA @ 5deg Ct	MES	Time@5deg	COS	Time@COS	MOS	Time@MOS	YRR1(%)	YR1 (deg/sec)	YRR1 Ct	YRR175(%)	YR175 (deg/sec)
0014	708	49.514	3.533	1090	5.443	846	4.224	0.710	0.089	1290	4.244	0.532
0015	707	49.658	3.526	1090	5.441	846	4.222	-0.661	-0.096	1290	1.262	0.183
0016	706	49.731	3.523	1089	5.440	846	4.223	-0.788	-0.140	1289	2.678	0.477
0017	705	49.787	3.519	1089	5.439	845	4.220	-0.757	-0.162	1289	2.329	0.499
0018	705	49.589	3.516	1089	5.437	845	4.218	-0.842	-0.206	1289	1.704	0.417
0019	705	49.922	3.518	1089	5.440	846	4.221	-0.052	-0.013	1289	0.752	0.188
0020	705	49.678	3.516	1089	5.437	845	4.219	-0.648	-0.176	1289	1.143	0.310
0021	705	49.638	3.517	1089	5.437	846	4.220	-0.495	-0.140	1289	0.757	0.213
0022	705	49.642	3.518	1089	5.438	846	4.221	-0.519	-0.142	1289	0.425	0.116
0023	704	49.849	3.515	1088	5.433	845	4.218	0.091	0.025	1288	0.296	0.082
0024	705	49.423	3.520	1089	5.437	846	4.222	0.091	0.026	1289	0.892	0.260
0025	706	49.946	3.521	1089	5.437	846	4.221	-0.512	-0.149	1289	0.325	0.094
0026	705	49.588	3.516	1088	5.432	845	4.217	0.325	0.100	1288	0.925	0.286
0027	706	49.477	3.520	1089	5.436	846	4.221	-0.222	-0.069	1289	-0.249	-0.078

RIGHT-TO-LEFT (INITIAL CLOCKWISE STEER)

File	SWA @ 5deg Ct	MES	Time@5deg	COS	Time@COS	MOS	Time@MOS	YRR1(%)	YR1 (deg/sec)	YRR1 Ct	YRR175(%)	YR175 (deg/sec)
0028	708	49.461	3.531	1090	5.441	845	4.218	1.030	-0.126	1290	-0.095	0.012
0029	707	49.907	3.529	1090	5.444	846	4.222	-0.531	0.084	1290	-2.543	0.401
0030	706	49.330	3.523	1090	5.441	845	4.219	0.634	-0.118	1290	-4.184	0.778
0031	706	49.634	3.522	1090	5.440	845	4.220	-0.976	0.209	1290	-2.176	0.467
0032	705	49.697	3.516	1089	5.437	845	4.217	-1.175	0.292	1289	-2.652	0.659
0033	705	49.657	3.517	1089	5.438	845	4.218	-1.476	0.374	1289	-0.431	0.109
0034	707	49.608	3.529	1091	5.450	848	4.230	-1.171	0.317	1291	-1.770	0.479
0035	705	49.762	3.520	1089	5.440	846	4.221	-1.184	0.343	1289	0.248	-0.072
0036	705	49.789	3.516	1088	5.435	845	4.217	-0.882	0.252	1288	-0.498	0.142
0037	704	49.721	3.515	1088	5.433	845	4.216	-0.844	0.251	1288	0.400	-0.119
0038	705	49.429	3.518	1089	5.436	845	4.219	-0.264	0.078	1289	0.218	-0.064
0039	707	49.615	3.527	1090	5.444	847	4.228	-1.343	0.407	1290	-0.739	0.224
0040	705	49.788	3.516	1088	5.433	845	4.217	-0.001	0.000	1288	-0.511	0.155
0041	706	49.697	3.521	1089	5.437	846	4.221	-0.218	0.066	1289	0.061	-0.019

7.4 SINE WITH DWELL TEST RESULTS

2019 RAM 1500

NHTSA No.: C20190303

Date Created 24-Jul-19

LEFT-TO-RIGHT (INITIAL COUNTER-CLOCKWISE STEER)

File	YRR175 Ct	2nd Yaw Peak(deg/sec)	2nd Yaw Peak Ct	Lat Disp (ft)	Lat. Acc. 1.07s (g)	1st SWA Peak(deg)	1st SWA Peak Ct	2nd SWA Mean(deg)
0014	1440	12.542	971	-4.289	0.411	53.876	774	53.759
0015	1440	14.525	928	-5.375	0.500	70.276	774	70.187
0016	1439	17.802	923	-6.493	0.557	88.120	774	87.899
0017	1439	21.411	922	-7.312	0.620	105.302	774	105.309
0018	1439	24.459	918	-7.959	0.656	123.340	773	123.369
0019	1439	24.983	913	-8.415	0.661	140.462	774	140.291
0020	1439	27.151	912	-8.663	0.700	158.847	774	158.745
0021	1439	28.190	911	-8.873	0.711	176.445	774	176.199
0022	1439	27.402	910	-8.936	0.684	193.504	774	193.161
0023	1438	27.770	908	-8.865	0.671	211.797	773	211.211
0024	1439	29.104	909	-8.831	0.663	228.871	774	228.277
0025	1439	29.010	909	-8.983	0.635	246.898	774	246.230
0026	1438	30.898	910	-8.865	0.682	264.007	774	263.132
0027	1439	31.272	909	-9.021	0.690	270.742	774	269.920

RIGHT-TO-LEFT (INITIAL CLOCKWISE STEER)

File	YRR175 Ct	2nd Yaw Peak(deg/sec)	2nd Yaw Peak Ct	Lat Disp (ft)	Lat. Acc. 1.07s (g)	1st SWA Peak(deg)	1st SWA Peak Ct	2nd SWA Mean(deg)
0028	1440	-12.199	938	4.149	-0.417	53.662	774	53.645
0029	1440	-15.768	987	5.091	-0.503	69.967	774	70.193
0030	1440	-18.589	933	5.981	-0.584	87.779	774	88.139
0031	1440	-21.449	925	6.807	-0.632	105.159	774	105.125
0032	1439	-24.848	925	7.413	-0.675	123.042	773	123.366
0033	1439	-25.354	914	7.856	-0.691	140.097	774	140.409
0034	1441	-27.083	916	8.271	-0.721	158.657	776	158.762
0035	1439	-28.969	913	8.317	-0.753	176.169	774	176.340
0036	1438	-28.533	912	8.582	-0.728	193.215	774	193.170
0037	1438	-29.763	910	8.446	-0.735	211.580	773	211.245
0038	1439	-29.448	911	8.363	-0.733	228.662	774	228.314
0039	1440	-30.278	913	8.316	-0.740	246.666	776	246.327
0040	1438	-30.413	911	8.505	-0.695	263.645	774	263.338
0041	1439	-30.335	910	8.453	-0.691	270.554	774	270.065

7.5 SLOWLY INCREASING STEER TEST RESULTS

2019 RAM 1500

NHTSA No.: C20190303

Date Created 24-Jul-19

File	Vehicle	EventPt	DOS	MES [mph]	Mean SPD [mph]	AYcount_3	THETAENCF_3 [degree]	AYCG_CD2_3 [g]	r_squared	ZeroBegin	ZeroEnd
0006	2019 RAM 1500	696	1	50.400	50.458	1216	-35.172	-0.302	0.998	496	696
0008	2019 RAM 1500	680	1	49.940	49.878	1223	-35.411	-0.307	0.996	480	680
0009	2019 RAM 1500	694	1	49.354	49.358	1221	-35.556	-0.309	0.996	494	694
0010	2019 RAM 1500	705	0	50.562	50.448	1207	34.084	0.303	0.994	505	705
0011	2019 RAM 1500	705	0	49.773	49.806	1225	35.237	0.305	0.996	505	705
0012	2019 RAM 1500	707	0	50.594	50.138	1223	35.008	0.298	0.996	507	707
	Averages						35.1	0.304			

Scalars	Steering Angles (deg)
1.5	53
2.0	70
2.5	88
3.0	105
3.5	123
4.0	140
4.5	158
5.0	176
5.5	193
6.0	211
6.5	228
7.0	246
7.5	263
7.7	270

7.6 INERTIA SENSOR MEASUREMENTS

2019 RAM 1500

NHTSA No.: C20190303

Device : U12-05-08-07108					x-distance (longitudinal)	Point of reference is the front axle centerline.			
device version : 2.25						(Positive from front axle toward rear of vehicle.)			
device certification date : 9/19/18									
today is : 7/23/19					y-distance (lateral)	Point of reference is the vehicle centerline.			
units : Millimeters						(Positive from the center toward the right.)			
Label	ActualX	ActualY	ActualZ		z-distance (vertical)	Point of reference is the ground plane.			
						(Positive from the ground up.)			
					Roof Height (relative to ground)			1905.449	
M_FRT_AXLE_CENTER	0	0	0		**Motion Pak - x-distance (mm)**	1905.946			
C_COORDSYS001	0	0	0		**Motion Pak - y-distance (mm)**		-27.732		
M_TIRE_TREAD_CENTER	341.1622	76.60533	-228.381		**Motion Pak - z-distance (mm)**			1079.272	
M_INERTIA_PACK	1905.946	916.3732	795.4297						
M_ROOF	2337.116	935.3223	1532.706						
M_GROUND	2336.199	-305.718	-372.743		**Motion Pak - x-distance (inches)**	75.037			
M_REAR_AXLE_CENTER	3673.553	2.250638	4.9538		**Motion Pak - y-distance (inches)**		-1.092		
Track Width		1735			**Motion Pak - z-distance (inches)**			42.491	